United Nations A/AC.105/757

General Assembly

Distr.: General
30 January 2001

Original: English

**Committee on the Peaceful Uses of Outer Space**

# Coordination of outer space activities within the United Nations system: programme of work for 2001 and 2002 and future years

## Report of the Secretary-General*

Contents


| Chapter | | Paragraphs | Page |
|---|---|---|---|
| I. | Introduction | 1-8 | 6 |
| II. | Participants in outer space activities of the United Nations system and matrix of outer space programmes | 9 | 7 |
| III. | Policies and strategies pertaining to coordination of space-related activities | 10-23 | 7 |
| IV. | Current space-related activities | 24-284 | 11 |
| | A. Protecting the Earth's environment and managing natural resources | 24-117 | 11 |
| | 1. Advancement of Earth science | 24-47 | 11 |
| | 2. Assessment and monitoring of the Earth's environment | 48-91 | 16 |
| | 3. Management of natural resources | 92-117 | 22 |
| | B. Using space applications for human security, development and welfare | 118-196 | 26 |
| | 1. Enhancing disaster reduction capability | 118-161 | 26 |
| | 2. Enhancing economic, social and cultural security | 162-196 | 31 |
| | C. Utilizing and facilitating information and communications technology for development | 197-232 | 36 |
| | D. Using and improving satellite positioning and location capabilities | 233-239 | 41 |


* The text of the present report was finalized by the Inter-Agency Meeting on Outer Space Activities, held from 22 to 24 January 2001.

V.01-80271 (E) 050201 080201

E. Building capacity for space applications for sustainable development ..... 240-264 42

F. Advancing scientific knowledge of space and protecting the space environment ..... 265-266 46

G. Other activities ..... 267-284 46

V. Concluding remarks on matters related to the coordination of activities within the United Nations system ..... 285-287 48

Annexes

I. Calendar of significant events ..... 50

II. List of significant outputs ..... 54

## Abbreviations

| | |
|---|---|
| AFRICOVER | Land Cover Map and Geodatabase for Africa (FAO) |
| AGRHYMET | Regional Training Centre for Agrometeorology and Operational Hydrology and their Applications |
| ARTEMIS | Advanced Real-Time Environmental Monitoring Information System (FAO) |
| AVHRR | advanced very high resolution radiometer |
| CEOS | Committee on Earth Observation Satellites |
| CILS | CEOS Information Locator System |
| CGMW | Commission for the Geological Map of the World |
| CNS/ATM | communications, navigation and surveillance/air traffic management |
| DCP | data collection platform |
| EAP.AP-Bangkok | Environment Assessment Programme for Asia and the Pacific (UNEP) |
| EC | European Commission |
| ECA | Economic Commission for Africa |
| ECE | Economic Commission for Europe |
| ECLAC | Economic Commission for Latin America and the Caribbean |
| ENRIN | Environment and Natural Resources Information Networking (UNEP) |
| EROS | Earth Resources Observation Systems |
| ERS | European Remote Sensing satellite |
| ESA | European Space Agency |
| ESCAP | Economic and Social Commission for Asia and the Pacific |
| ESRI | Environmental Systems Research Institute (United States of America) |
| EUMETSAT | European Organization for the Exploitation of Meteorological Satellites |
| Eurostat | Statistical Office of the European Communities |
| FAO | Food and Agriculture Organization of the United Nations |
| FRA | forest resources assessment (FAO) |
| GARS | Geological Applications of Remote Sensing (UNESCO/IUGS) |
| GAW | Global Atmosphere Watch (WMO) |
| GCOS | Global Climate Observing System (ICSU/IOC/UNEP/WMO) |

| | |
|---|---|
| GDIN | Global Disaster Information Network |
| GEF | Global Environment Facility |
| GIEWS | Global Information and Early Warning System on Food and Agriculture (FAO) |
| GIS | geographic information system |
| GLONASS | Global Navigation Satellite System (Russian Federation) |
| GNSS | global navigation satellite systems |
| GOOS | Global Ocean Observing System (ICSU/IOC of UNESCO/UNEP/WMO) |
| GOS | Global Observing System |
| GOSSP | Global Observing Systems Space Panel |
| GPS | Global Positioning System (United States of America) |
| GRID | Global Resource Information Database (UNEP) |
| GTOS | Global Terrestrial Observing System (FAO/ICSU/UNEP/UNESCO/WMO) |
| HYCOS | Hydrological Cycle Observing System (WMO) |
| IAEA | International Atomic Energy Agency |
| ICAO | International Civil Aviation Organization |
| ICIMOD | International Centre for Integrated Mountain Development |
| ICSU | International Council for Science |
| ICT | information and communication technology |
| IGAD | Intergovernmental Authority on Development |
| IGOS | Integrated Global Observing Strategy |
| IMO | International Maritime Organization |
| IMS | Internet map server |
| IMSO | International Mobile Satellite Organization |
| INPE | National Institute for Space Research (Brazil) |
| IOC | Intergovernmental Oceanographic Commission (UNESCO) |
| ISDR | International Strategy for Disaster Reduction |
| ITC | International Institute for Aerospace Survey and Earth Sciences |
| ITU | International Telecommunication Union |
| IUGS | International Union of Geological Sciences |
| Landsat | Land Remote Sensing Satellite |
| LCCS | Land Cover Classification System (FAO) |

| | |
|---|---|
| MAB | Man and Biosphere programme (UNESCO) |
| MIRCEN | microbial resources centre (UNESCO) |
| MODIS | Moderate-resolution imaging spectroradiometer |
| NASA | National Aeronautics and Space Administration (United States of America) |
| NOAA | National Oceanic and Atmospheric Administration (United States of America) |
| RESAP | Regional Space Applications Programme for Sustainable Development |
| ROPME | Regional Organization for the Protection of the Marine Environment |
| SADC | Southern African Development Community |
| SHARE | Structured Humanitarian Assistance Reporting framework |
| UNCTAD | United Nations Conference on Trade and Development |
| UNDCP | United Nations International Drug Control Programme |
| UNDP | United Nations Development Programme |
| UNEP | United Nations Environment Programme |
| UNESCO | United Nations Educational, Scientific and Cultural Organization |
| UNHCR | Office of the United Nations High Commissioner for Refugees |
| UNICEF | United Nations Children's Fund |
| UNISPACE III | Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space |
| UNITAR | United Nations Institute for Training and Research |
| WCMC | World Conservation Monitoring Centre |
| WFP | World Food Programme |
| WHO | World Health Organization |
| WiFS | Wide Field-of-view Sensor |
| WIPO | World Intellectual Property Organization |
| WMO | World Meteorological Organization |

# I. Introduction

1. Since the beginning of the space age in 1957, space exploration and exploitation have yielded tremendous scientific as well as economic and societal benefits for humanity. Space science and technology and their applications are recognized by many as one of the major tools to understand the Earth's environment, to improve management of natural resources, to better prepare ourselves for natural disasters and to provide effective communications across long distances and to rural areas.

2. Earth observation satellites provide an important and unique source of data for the study of the Earth's system. Information from such satellites is being used to address issues of social and economic importance in such areas as food security, land management, disaster reduction and emergency management, agricultural and fisheries management, forest resource assessment, global health, environment monitoring and development planning. Emerging new services using satellite communications provide more efficient solutions for improving education and training opportunities, ensuring access to adequate medical services, increasing the effectiveness of disaster warning and relief operations and developing adaptation or mitigation strategies in relation to climate change. Meteorological and Earth observation satellites provide the data for weather forecasts, contributing to better planning of agricultural strategies and various daily activities, while the warnings they provide on hurricanes and cyclones have dramatically reduced material and human losses in many countries that are prone to such disasters. Satellite positioning systems, such as the Global Positioning System (GPS) and the Global Navigation Satellite System (GLONASS), originally deployed for strategic military purposes, now provide non-encrypted signals, free of charge, for civilian applications such as air, land and nautical navigation, enhancing the safety of air, land and sea travel.

3. Space applications already contribute to the protection of the Earth's environment by providing and disseminating critical information on the state of the Earth. If used effectively, space science and technology could contribute significantly to accelerating development in many different ways without compromising the needs of future generations. They could provide better alternatives for survival to those who are caught in the downward spiral of environmental degradation and increasing poverty, forced to exploit limited natural resources for survival and impoverished further by the depletion of resources.

4. Space applications also contribute to early warning, disaster preparedness, disaster mitigation, disaster impact assessment, risk assessment, vulnerability reduction, disaster relief and disaster rehabilitation, minimizing the loss of human life and damage to property caused by natural disasters and facilitating reconstruction of the economic and social foundation after disasters. Natural disasters can destroy in minutes all the progress made in social and economic development over years by developing countries. Space applications offer a cost-effective tool to secure sustainable economic and social development. The profile of space applications for disaster reduction and emergency management has increased in the last few years and should be strengthened in the future.

5. Many organizations of the United Nations system promote sustainable development through their activities, in particular in developing countries. Space applications can support their efforts in various ways. Some organizations of the United Nations system have already incorporated the routine operational use of space tools in their development activities and have been active in promoting international cooperation in the application of space science and technology within their specific domain of responsibility.

6. Recognizing the increasing need to coordinate the space activities of the various organizations of the United Nations system, the Administrative Committee on Coordination in 1975 established a subcommittee on outer space activities to ensure cooperation among interested organizations in future programmes and projects in the fields of communications, meteorology, remote sensing and geographic information systems (GIS). The Inter-Agency Meeting on Outer Space Activities meets annually and provides a forum for the participating organizations of the United Nations system to exchange information and views on the current and future plans of space-related activities of common interest and to promote collaboration and synergy among the entities in the United Nations system. The Office for Outer Space Affairs of the

United Nations Secretariat serves as the secretariat of the Meeting.

7. In 1975, the Committee on the Peaceful Uses of Outer Space also recognized the growing need for coordination in view of the increasing volume of outer space activities and greater involvement of the organizations of the United Nations system and recommended that an integrated account of the plans and programmes of the organizations be prepared to ensure the effectiveness of the various programmes. The Secretary-General was asked to produce such a report, on an annual basis, for consideration by the Committee's Scientific and Technical Subcommittee. Since the first report of the Secretary-General on the coordination of outer space activities within the United Nations was submitted to the Subcommittee in 1976 (A/AC.105/166 and Corr.1), 24 reports have been issued to date. The Inter-Agency Meeting, at its annual session, reviews and finalizes the report. In recent years, some 10 to 12 organizations have been attending the annual session of the Inter-Agency Meeting and contributing to the report.

8. At its eighteenth session, the Inter-Agency Meeting reached agreement that consideration should be given to the possibility of re-categorizing space-related activities to better reflect in the annual report of the Secretary-General on the coordination of outer space activities within the United Nations system the priority areas of application being identified by Member States. At its twentieth session, in 2000, the Inter-Agency Meeting agreed on the revised structure contained in the report on its work at that session (see A/AC.105/727, annex I).

## II. Participants in outer space activities of the United Nations system and matrix of outer space programmes

9. The participants in outer space activities within the United Nations system include the following Secretariat units, bodies, research institutes, specialized agencies and other entities: Office for Outer Space Affairs, Office for the Coordination of Humanitarian Affairs, Department for Economic and Social Affairs, secretariat for the International Strategy for Disaster Reduction (ISDR), Economic Commission for Africa (ECA), Economic Commission for Europe (ECE), Economic Commission for Latin America and the Caribbean (ECLAC), Economic and Social Commission for Asia and the Pacific (ESCAP), United Nations Development Programme (UNDP), United Nations Environment Programme (UNEP), Office of the United Nations High Commissioner for Refugees (UNHCR), United Nations International Drug Control Programme (UNDCP), United Nations Institute for Training and Research (UNITAR), Food and Agriculture Organization of the United Nations (FAO), United Nations Educational, Scientific and Cultural Organization (UNESCO), International Civil Aviation Organization (ICAO), World Health Organization (WHO), World Bank, International Telecommunication Union (ITU), World Meteorological Organization (WMO), International Maritime Organization (IMO), World Intellectual Property Organization (WIPO) and International Atomic Energy Agency (IAEA).

## III. Policies and strategies pertaining to coordination of space-related activities

10. In its resolution 54/68 of 6 December 1999, the General Assembly endorsed the resolution of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III) entitled "The Space Millennium: Vienna Declaration on Space and Human Development",[1] which is the nucleus of a strategy to address global challenges such as protecting the Earth's environment and managing its resources; using space applications for human security, development and welfare; advancing scientific knowledge of space and protecting the space environment; and enhancing education and training opportunities and ensuring public awareness of the importance of space activities; urged organizations within the United Nations system to take the necessary action for the effective implementation of the Vienna Declaration, requested all relevant organizations of the United Nations system to review and, where necessary, adjust their programmes and activities in line with the recommendations of UNISPACE III and to take appropriate measures to ensure their full and effective implementation, in particular by further enhancing the coordination of their space-related activities through the Inter-Agency Meeting.

Table
**Participants in outer space activities and matrix of outer space programmes**[a, b]

| *United Nations entity* | *Protecting the Earth's environment* | *Human security, development and welfare* | *Information and communiations technology* | *Satellite position and location capabilities* | *Building capacity* | *Advancing scientific knowledge* | *Other activities* |
|---|---|---|---|---|---|---|---|
| Office for Outer Space Affairs | 24 | 118, 120, 122-124, 162 | 197, 198 | 233 | 240-243 | 265, 266 | 267-270 |
| Office for the Coordination of Humanitarian Affairs | | 128 | | | | | |
| Secretariat for ISDR | | 118-121, 125 | | | | | |
| ECA | | 165-167 | 202-205 | | 252, 253 | | |
| ECE | 92, 117 | 168 | | | 254-256 | | 271 |
| ECLAC | 35, 48 | 137 | 206 | | | | 272 |
| ESCAP | 24, 49-51, 94 | 138-141 | 207-210 | | 250, 257-259 | | 273-277 |
| UNDP | 37, 75 | 143, 172, 180, 185 | | | 250, 264 | | 271 |
| UNEP | 24, 25, 27, 29, 30, 33, 34, 52-81, 84, 95-97 | 118, 142-146, 169-173 | 199-201 | | 244-251 | | 271 |
| UNHCR | 82, 102 | 126-136, 171 | | | | | 271 |
| UNICEF | | 128, 131 | | | | | |
| WFP | 108 | 128 | | | | | |
| UNDCP | | 162-164 | | | | | |
| UNITAR | 90 | | | | | | 271 |
| FAO | 24-26, 30, 33, 34, 36, 76, 83, 84, 94, 97-108, 117 | 118, 128, 146-149, 164, 173-184 | | | 260-262 | | 278 |
| UNESCO | 24, 25, 27, 29-34, 38-40, 46, 81, 84-88, 101, 107, 109-117 | 118, 151-156, 161, 185-195 | 228-232 | | | | 279-283 |
| ICAO | | 160 | | 234-239 | | | |
| WHO | 37 | | | | | | 271 |
| World Bank | 37, 75, 102 | | | | | | 271 |
| ITU | 89, 90 | 150, 192 | 211-227, 229 | 235 | | | |
| WMO | 24, 25, 27-30, 32-34, 37-47, 84, 91 | 118, 157-161, 196 | | | 263, 264 | | |
| IMO | | 161 | | 236 | | | |
| WIPO | | | | | | | 284 |
| IAEA | | | | | | | 268 |

[a]The numbers in each column indicate the relevant paragraphs in the present report.

[b]For continuously updated information on the coordination of outer space activities within the United Nations system, see http://www.uncosa.unvienna.org/

11. The Committee on the Peaceful Uses of Outer Space and its Scientific and Technical Subcommittee, at their sessions held in 2000, continued to stress the necessity of ensuring continuous and effective consultations and coordination in the field of outer space activities among organizations within the United Nations system and the avoidance of duplicative activities. In that connection, the Committee and the Subcommittee noted with satisfaction that the Inter-Agency Meeting had held its twentieth session at the United Nations Office at Vienna from 2 to 4 February 2000 and that the report on its deliberations (A/AC.105/727) and the report of the Secretary-General on coordination of outer space activities within the United Nations system: programme of work for 2000 and 2001 and future years (A/AC.105/726) were before the Committee and the Subcommittee. The Committee and the Subcommittee also noted that the next session of the Inter-Agency Meeting was scheduled to be held in Vienna from 22 to 24 January 2001 and that it would be hosted by the Office for Outer Space Affairs.

12. At its 2000 session, the Committee on the Peaceful Uses of Outer Space endorsed the recommendation of its Scientific and Technical Subcommittee that, commencing with its session in 2001, the Subcommittee should consider a new item entitled "Means and mechanisms for strengthening inter-agency cooperation and increasing the use of space applications and services within the United Nations system and among United Nations specialized agencies and bodies" according to the following three-year work plan:

2001 An analysis of the current levels of usage of space applications and services within the United Nations system, including one day for presentations by appropriate United Nations entities and Member States that undertake cooperative activities with those entities; and an examination of the utility of space applications and services for increasing, with regard to space activities, the effectiveness, efficiency and coordination of the operations of United Nations entities;

2002 An identification of the barriers to greater use of space applications and services within the United Nations system and an examination of specific means and mechanisms to eliminate those barriers;

2003 The development of specific and concrete proposals and, as appropriate, action plans for strengthening inter-agency cooperation in the use of space within the United Nations system and for increasing the use of space applications and services within the system in general and among particular United Nations entities.

13. In connection with the above work plan, the Committee also approved the list of questions contained in a document that the Office for Outer Space Affairs had prepared in response to a request by the Subcommittee (A/AC.105/L.223). The organizations of the United Nations system were subsequently invited by the Office for Outer Space Affairs to provide information in response to the questions. In its resolution 55/122 of 8 December 2000, the General Assembly encouraged all the organs, organizations and programmes of the United Nations system to contribute to the work of the Subcommittee by providing it with appropriate information in response to the list of questions.

14. One emerging aspect is the potential beneficial impact that satellite techniques can have on local communities in the domain of disaster reduction and emergency management. The increased impact of natural disasters and the growing vulnerability of societies to all forms of hazard have resulted in the need to develop risk management measures and apply them to vulnerable communities worldwide, especially through regional programmes. The secretariat for ISDR indicated that the demand for space applications for disaster reduction is growing steadily as more complex scenarios require more integrated approaches to managing risk and preventing disasters. The secretariat for ISDR and the Office for Outer Space Affairs have therefore concluded an agreement for inter-agency cooperation on the issue and collaborate actively within the United Nations Programme on Space Applications.

15. In 2000, the Division for Economic and Social Council Support and Coordination of the Department of Economic and Social Affairs assisted the Economic and Social Council in taking a leadership role in bringing the question of information and communication technology (ICT) for development to the forefront of intergovernmental attention at the United Nations. The high-level segment of the Council at the ministerial level in July 2000 was the first time ever that a United Nations intergovernmental forum, with the active participation of the private sector, had given in-depth attention to the power and promise of ICT in the emerging knowledge-based economy. The deliberations made abundantly clear that closing the digital divide could not and should not be the responsibility of any one group of stakeholders. At the same time, for the Council to focus its attention on the promise of ICT was clear recognition of the role such technologies could play in addressing issues of overarching importance to common development goals and most prominently to the reduction and eventual eradication of poverty.

16. The Council's Ministerial Declaration affirmed the key role of the United Nations system in bringing ICT to the service of development for all. It recommended the establishment of an ICT task force and a trust fund to promote universal and affordable access to ICT and the use of ICT for development. That effort is aimed at bringing together all relevant stakeholders, from developed and developing countries, public and private sectors, academia, foundations and civil society, to build partnerships for forging digital solutions and mobilizing new resources for the well-being of all, especially the world's poor. The Council's recommendations were subsequently endorsed in the United Nations Millennium Declaration adopted by the General Assembly at the Millennium Summit in September 2000.

17. As follow-up to the Council's relevant decisions, the Secretary-General has started a comprehensive process of consultation with all relevant stakeholders on the composition, governance, structure, mandate, terms of reference, secretarial support and project implementation arrangements for the task force and the trust fund. One of the primary objectives of the process is to make it inclusive, to bring together and create synergies among many other initiatives that are attempting to deal with the complexities of the digital divide, in particular the Digital Opportunity Task (DOT) Force launched by the group of eight major industrialized countries.

18. During the course of 2000, several panel discussions on the topic of ICT were organized by the Division for Economic and Social Council Support and Coordination, in collaboration with agencies and organizations of the United Nations system, for delegations to the Economic and Social Council and the Second Committee of the General Assembly. Examples include one held on 7 July at which the Secretary-General of the United Nations Conference on Trade and Development (UNCTAD) and the heads of the regional commissions discussed "Information and Communication Technology and Development: Global Challenges and Regional Imperatives", a high-level expert meeting on information technology, held in April 2000, and an informal panel dialogue at the level of the General Assembly and the Economic and Social Council on "ICT in Development", held on 13 December.

19. In March 2000, the United Nations Geographic Information System Working Group was established under the auspices of the Consultative Committee on Programme and Operational Questions of the Administrative Committee on Coordination to coordinate activities and formulate policies concerning geographic information within the United Nations system. Its mandate is to increase the role of geographic information in both vertical and horizontal United Nations structures through cooperation with external institutions such as non-governmental organizations, research and academic institutions and technology producers. The Working Group is chaired by the Chief of the Cartographic Section of the Library and Information Resources Division of the Department of Public Information and consists of task managers and technical focal points from agencies throughout the system. ECE, UNEP, UNDCP, UNHCR and UNESCO, for example, will continue their cooperation within the framework of the Working Group.

20. In accordance with Economic and Social Council resolution 1998/46 of 31 July 1998 on regional coordination, in which the Council mandated the regional commissions to play a leading role and act as regional arms of the United Nations Secretariat, ESCAP will continue to contribute to the harmonization of space technology applications activities in Asia and the Pacific. The Regional Coordination Meeting

would ideally focus on collaboration at the subregional level. Inter-agency meetings should deal with specific ad hoc issues and be result-based and target-oriented.

21. The development objective of ESCAP in the field of space activities is to strengthen the national capacity of members and associate members to achieve sustainable development and improved quality of life, as well as regional and subregional cooperation on protection of the environment and development and management of natural resources, taking into account the recommendations of the Programme for the Further Implementation of Agenda 21, adopted by the General Assembly at its nineteenth special session (resolution S/19-2, annex), and of UNISPACE III and the priorities set by members and associate members of ESCAP at intergovernmental legislative meetings.

22. The Regional Inter-Agency Committee for Asia and the Pacific and its subcommittees, including the Subcommittee on Space Applications for Sustainable Development, were replaced by the Regional Coordination Meeting, which has nine thematic working groups, including one on environment and development. The secretariat of ESCAP will continue to service the Regional Coordination Meeting. The inter-agency meetings on the Regional Space Applications Programme for Sustainable Development (RESAP) will be organized under the aegis of the environment and development advocacy of the Regional Coordination Meeting mechanism.

23. ESCAP will follow up on the recommendations of the Second Ministerial Conference on Space Applications for Sustainable Development in Asia and the Pacific, held in November 1999, to further strengthen the regional cooperative network and enhance the national capacities in space technology applications through the implementation of the second phase of RESAP, known as RESAP II. Efforts will be made to promote integrated applications of information technology and space technology to address issues of common concern among countries of the region with regard to environment and natural resource management, food security, capacity-building, human resource development and education, poverty alleviation, natural disaster reduction, health care and hygiene and sustainable development planning.

# IV. Current space-related activities

## A. Protecting the Earth's environment and managing natural resources

### 1. Advancement of Earth science

24. In 2001 and 2002, the Office for Outer Space Affairs, ESCAP, UNEP, FAO, the Intergovernmental Oceanographic Commission (IOC) of UNESCO and WMO will continue to contribute to the work of the Committee on Earth Observation Satellites (CEOS) as associate members and participate in the implementation of the IGOS strategy.

25. FAO, the International Council for Science (ICSU), UNEP, UNESCO and WMO are founding members of the Global Terrestrial Observing System (GTOS). The central mission of GTOS is to provide policy makers, resource managers and researchers with decision support tools and access to the data needed to detect, quantify, locate, understand and warn of changes (especially reductions) in the capacity of terrestrial ecosystems to support sustainable development. GTOS focuses on five issues of global concern: changes in land quality; availability of freshwater resources; loss of biodiversity; pollution and toxicity; and climate change. The system aims to provide guidance in data analysis and to promote (a) integration of biophysical and socio-economic geo-referenced data; (b) interaction between monitoring networks, research programmes and policy makers; (c) data exchange and application; and (d) quality assurance and harmonization of measurement methods.

26. The FAO Environment and Natural Resources Service hosts the GTOS secretariat at its headquarters on behalf of the GTOS sponsors. The GTOS secretariat, under the guidance of the GTOS Steering Committee, is currently developing a global terrestrial observing network and a terrestrial ecosystem monitoring sites meta-database, and is planning to hold joint regional workshops with the Global Climate Observing System (GCOS) to formulate regional activities. Closer cooperation is also envisaged with other parties in the framework of priorities identified by the partners of the Integrated Global Observing Strategy (IGOS), including in particular a theme on terrestrial carbon monitoring, initially involving the estimation of global net primary productivity, evolving into a terrestrial carbon observation (TCO) theme, which would

initially include global mapping and monitoring of carbon sources and sinks. Following formal endorsement of the IGOS TCO theme at the thirteenth plenary meeting of CEOS, held in Stockholm in November 1999, planning meetings for future activities were held in Ottawa and Lisbon in February and May 2000, respectively. GTOS is also actively developing subregional data and information networks in eastern Europe and southern Africa. Further details on GTOS activities can be found at http://www.fao.org/gtos

27. ICSU, UNEP, IOC and WMO continue to support the implementation of a global system for observing climate through their sponsorship of GCOS. GCOS is intended to be a longer-term, user-driven operational system capable of providing the comprehensive observations required for monitoring the climate system, for detecting and attributing climate change, for assessing the impact of climate variability and change and for supporting research aimed at improving the understanding, modelling and prediction of the climate system. It addresses the total climate system, including physical, chemical and biological properties and atmospheric, oceanic, hydrologic, cryospheric and terrestrial processes.

28. GCOS has defined an initial operational system (IOS), which is being implemented under the direction of the GCOS Steering Committee and supported by the GCOS secretariat, which is located at the WMO secretariat in Geneva. IOS is made up of the relevant components of existing or planned observational networks such as the WMO Global Observing System (GOS) and Global Atmosphere Watch (GAW) and the climate components of the Global Ocean Observing System (GOOS) and GTOS as well as the enhancements and new systems needed to meet the requirements for climate observations. Space-based observations form an integral and crucial part of IOS and the detailed needs of GCOS for such observations have been defined by the GCOS/GOOS/GTOS Global Observing Systems Space Panel (GOSSP). GCOS and GOSSP work in close cooperation with CEOS in attempting to ensure that the necessary observations from space will be obtained. Further details on those activities can be found on the GCOS Web site, http://www.wmo.ch/web/gcos/gcoshome.html

29. The GCOS secretariat, established jointly by UNEP, WMO, IOC and ICSU, reports frequently on the GCOS Steering Committee and on expert and panel meetings. Revised and updated space observation and in situ observation plans, including recommendations and a list of user requirements, are available from the GCOS secretariat. In addition, the GCOS secretariat, on behalf of its observing system partners, has provided input on systematic observations to the United Nations Framework Convention on Climate Change through its Subsidiary Body on Scientific and Technological Advice. This has resulted in the adoption by the Conference of Parties to the Framework Convention of several decisions supporting the development of global observing systems for climate that are based on the integration of space-based and in situ observations.

30. ICSU, UNEP, IOC and WMO continue to cooperate closely in the development, planning and implementation of GOOS. IOC will continue to contribute to the work of CEOS in the development of user requirements for sensors and data management systems within the framework of the GOOS programme. As a member of IGOS, IOC, along with UNEP, WMO, FAO, ICSU, the International Geological Correlation Programme, the World Climate Research Programme (WCRP) and CEOS, developed during 2000 a new thematic approach to IGOS in which the first element to be developed was the oceans theme. The oceans theme document was approved by CEOS in November 2000 and published in December 2000. GOOS has the lead role in implementing the oceans theme element of IGOS.

31. IOC, through the newly formed Coastal Ocean Observations Panel (COOP), stresses the importance of ocean colour data, in particular the optimization of quality of data for validation especially of coastal waters. The panel continues to advocate the collection of essential ocean and atmospheric data, data merging and access to data.

32. The WMO Joint Technical Commission for Oceanography and Marine Meteorology and IOC maintain a high level of interest in the use of satellites for ocean remote sensing and the provision of marine services based on satellite data. A rapporteur reports to the Commission and WMO members on issues relating to requirements for, access to and applications of remotely sensed ocean data. The rapporteur also liaises with the WMO Commission for Basic Systems and with GOSSP, and prepares regular reports for the Commission.

33. UNEP, FAO, IOC, WMO and ICSU have in the past cooperated in a Sponsors Group for GOS, or G3OS. The emergence of IGOS may provide a more suitable framework to ensure that appropriate advice and recommendations are forwarded to the sponsoring organizations and their governing bodies, the observing system steering committees, secretariats and expert panels, as well as possibly other groups, including funding bodies and Governments.

34. A number of partners, including members of CEOS, G3OS and sponsors, such as FAO, ICSU, IOC, UNEP, WMO and the International Group of Funding Agencies for Global Change Research (IGFA), have been working together closely since 1998 on the development of IGOS in an effort to optimize space-based and in situ observing networks and application programmes at the global, regional and national levels. IGOS was presented at UNISPACE III at a one-day high-level forum coordinated by FAO. Conclusions and proposals of the International Forum on the Integrated Global Observing Strategy are contained in the report of UNISPACE III.[2] IGOS is vigorously developing an integrated theme approach. The ocean and TCO themes have been endorsed by the IGOS partnership: the themes are to be coordinated by the National Aeronautics and Space Administration (NASA) of the United States of America and GTOS, respectively. A further theme on global water resources assessment, to be coordinated by WMO, is under consideration by IGOS partners and CEOS members.

35. The potential of support from space applications and services is always considered in the various ECLAC technical assistance missions and policy documents on subjects such as climate change issues.

36. Cooperation and partnership with other agencies is a major focus of FAO participation in climate-related activities. FAO is an active member of the Inter-Agency Committee on the Climate Agenda and cooperates on climate change matters with international bodies such as the secretariat of the United Nations Framework Convention on Climate Change and the Intergovernmental Panel on Climate Change (IPCC).

37. The application of satellite technology in meteorology, climatology and operational hydrology forms an important element of the technical cooperation activities of WMO. Those activities are generally undertaken with assistance from either the Organization's Voluntary Cooperation Programme or other sources of funding such as UNDP, the World Bank and the European Commission (EC). The following activities are planned for 2001 and future years:

(a) *Africa*. A number of WMO members, including France, Germany, Italy, the United Kingdom of Great Britain and Northern Ireland and the United States, are donating data collection platforms (DCPs) to countries in Africa for the collection of meteorological data via the geostationary meteorological satellite Meteosat, to improve the availability of observational data at national meteorological centres. Furthermore, eight satellite stations of the International Mobile Satellite Organization (IMSO) were installed in the countries that are members of the Permanent Inter-State Committee on Drought Control in the Sahel, with funding from the United States Agency for International Development (USAID), in order to enhance the flow of data and products between the Regional Training Centre for Agrometeorology and Operational Hydrology and their Applications (AGRHYMET) in Niamey and national AGRHYMET centres. In collaboration with the World Bank, WMO has drawn up plans to set up in Africa an advanced hydrological and environmental monitoring system using Meteosat. More than 100 DCPs will be installed on major rivers, costing between $10 million and $20 million over a period of five years. Special efforts have been made to develop and submit proposals to the European Union to provide support for the replacement of ground receiving satellite equipment in all African countries by the year 2001 in order to adapt to the Meteosat second-generation satellite. Within the framework of the Mediterranean Hydrological Cycle Observing System (MED-HYCOS), a project funded by the World Bank for the establishment of a hydrological information system for the Mediterranean basin, four Meteosat DCPs have been installed in Tunisia and one in Morocco. One DCP is to be installed in Algeria. These are part of a wider network of about 36 DCPs installed in several countries of the Mediterranean rim. A network of 55 Meteosat DCPs (of which 50 are already operational) is being installed in 11 Southern African Development Community (SADC) countries within the framework of the SADC-HYCOS project funded by EC for the development of a hydrological information system in the region. A pilot phase of the Western and Central African Hydrological Cycle Observing System (AOC-HYCOS) involving

11 countries of western and central Africa was launched in January 2000 with support from the Government of France. The existing regional hydrological database was transferred from Ougadougou to Niamey. The project continues the collection of data from the existing DCP networks of the Niger Basin Authority and the WHO African Programme for Onchocerciasis Control, which are based on the ARGOS system of the National Oceanic and Atmospheric Administration of the United States (NOAA-ARGOS). Eighteen Meteosat DCPs being installed in the Upper Niger basin in Guinea and Mali will be incorporated into the western and central African network;

(b) *Americas*. The increasing demand in many developing countries of WMO regions III and IV (South and North America), and the limited availability of experts in the major satellite-operating countries, prompted WMO to develop a new training strategy known as "training the trainers". That strategy takes an innovative approach to both training and applied research in satellite data utilization and shows how a regional meteorological training centre could develop considerable expertise in the utilization of, and training capability with, digital geostationary operational environmental satellite imagery by participating in a "virtual laboratory" with the Cooperative Institute for Research in the Atmosphere and Cooperative Institute for Meteorological Satellite Studies, both of NOAA. In addition to the above, through the ongoing project of regional cooperation activities in support of the research on global change in the Inter-American Institute for Global Climate Change countries, WMO provides training related to satellite image analysis and processing, using GIS, GIS-SPRING and Met-View software, to 15 countries of WMO regions III and IV. CD-ROM Land Remote Sensing Satellite (Landsat) images have been bought for the project to enhance the capabilities of the participating countries to process and analyse such data, using modern techniques already provided for the project in previous training courses and seminars. The DCP ground equipment is being replaced with the support of the United States;

(c) *Europe and newly independent States*. Installation of small satellite Earth stations to provide meteorological services will be pursued and strengthened, in particular for newly independent States, for the reception of meteorological information distributed via European Telecommunications Satellite Organization (EUTELSAT) satellites, by RETIM of France and FAX-E(urope) of Germany within the framework of regional meteorological telecommunications. MED-HYCOS is currently installing in several countries of the region a network of 36 Meteosat DCPs (of which 18 are already operational). Real-time data can be freely accessed on the MED-HYCOS Web site (http://www.medhycos.mpl.ird.fr);

(d) *Asia and the Pacific*. Satellite-based telecommunications systems are playing an increasing role in the distribution of meteorological data and products to national meteorological services. The international communication satellite systems operated by the National Weather Service of the United States will be extended to serve countries in the South Pacific. A satellite-based communications system is being operated to distribute meteorological information within Asia and is likely to be expanded to other countries in the area of coverage of the Asiasat satellite. The International Mobile Satellite Organization (Inmarsat)-M Earth Stations are also considered for improving communications of meteorological services in countries of the South Pacific.

38. The overall long-term goals of WCRP, jointly sponsored by WMO, ICSU and IOC, are to determine to what extent climate can be predicted and the extent of human influence on climate. Progress in the scientific programme depends on the successful continuation of existing and the development of new space-based Earth observing systems.

39. The successful implementation of the scientific plans for WCRP depends crucially, among other factors, on the development of a comprehensive and sustained global climate observational network, such as that envisaged in GCOS, in order to acquire the data needed to monitor climate, to detect climate change and establish its causes and to validate and improve climate models. In addition, special data are needed in support of an ever widening variety of complex dynamical, physical, chemical and biological processes that help govern the state and evolution of the climate system. Such specialized data sets are likely to need to be highly resolved in time and space and therefore gathered initially for a limited period only. High-priority process studies include cloud-radiation-climate interactions and air-sea interactions. Climate studies are by their very nature global in character and this

necessitates extensive use of space observations to provide the necessary coverage and continuity.

40. The strategy of WCRP continues to be to pursue its objectives through a small number of large-scale research, observational and modelling projects focused on aspects of climate that are best approached on an international basis. The current projects are the world ocean circulation experiment (WOCE); the climate variability and predictability (CLIVAR) study; the global energy and water cycle experiment (GEWEX); the stratospheric processes and their role in climate (SPARC) project; the Arctic climate system study (ACSYS); and the climate and cryosphere (CliC) project. Each uses observations from both operational meteorological and other satellites and depends on the planned and proposed new Earth observation satellites to be launched throughout the coming decade. In particular, the coordinated enhanced observing period (CEOP), being developed within seeks to constitute an initial step towards establishing an integrated global observing system for the water cycle that responds to both scientific requirements and social needs. To achieve its aims, it will be necessary to make maximum use during 2001-2003 of the new generation of Earth observation satellites, in addition to existing operational ones, through an integrated validation strategy.

41. Climate system monitoring activities within the World Climate Data and Monitoring Programme make use of satellite data for monitoring such parameters as sea level, atmospheric temperature, sea ice, snow cover, solar radiation, aerosol optical depth, albedo and clouds. The WMO World Climate Data Information Referral System (INFOCLIMA) includes information on some available satellite data sets needed for climate monitoring and research. A climate change detection project has been established under the World Climate Data and Monitoring Programme to advise on the suitability of data, including satellite data, for detecting climate change. The World Climate Applications and Services Programme continues to investigate and promote development of potential uses of satellite data in climate prediction and applications, especially within the framework of the Climate Information and Prediction Services (CLIPS) project.

42. The WMO World Climate Programme publishes on a regular basis information on the global climate system within the framework of projects such as the climate system monitoring and CLIPS projects. The information draws heavily on data received from space-based observation platforms.

43. The WMO Commission for Atmospheric Sciences continues to rely on the use of satellite data for research and for weather analysis and prediction on all time scales. The WMO programmes on weather prediction and tropical meteorology research continue to study the application of high-resolution quantitative satellite data. The newly established World Weather Research programme, focusing on high impact weather with major socio-economic consequences, has a strong nowcasting component that relies heavily on real-time satellite imagery.

44. As a part of its scientific activities, the WMO Commission for Hydrology has appointed an expert on remote sensing applications in hydrology to evaluate advances in and the application of remote sensing in hydrology, as well as the national capabilities in developing countries to make use of those technologies. The application of satellite-based observation technologies is also addressed by the experts in network design and water quantity data, as well as by the working groups on hydrology of the six WMO regional associations. The results of the activities of the Commission's experts and of the working groups will be available in 2004.

45. The World Hydrological Cycle Observing System (WHYCOS) is a global programme launched by WMO aimed at strengthening hydrological information systems and further promoting international cooperation to enhance sustainable socio-economic development. WHYCOS is implemented through regional or basin-wide HYCOS components. Within the framework of the programme, some 17 HYCOS components are at various stages of implementation or planning. A key element of many of these projects is the rehabilitation and upgrading of the local hydrological observation networks through the installation of a network of automatic satellite-linked DCPs. Through the WMO Global Telecommunications System (GTS) and other global networks such as the Internet, collected data are made available in near real time to water resource planners, decision makers, scientists and the general public. Within the framework of the two ongoing projects, MED-HYCOS for the Mediterranean rim and SADC-HYCOS for southern Africa, networks of 38 and 50 Meteosat DCPs,

respectively, are being installed. AOC-HYCOS started a pilot phase in November 1999. Similar developments are expected during the coming years in other regions, such as eastern Africa, the Caribbean, the south-western Pacific, the Baltic, the Black Sea, the Aral Sea and the Himalayan region basins, as soon as the relevant HYCOS components at present being developed are funded and launched.

46. The Data Buoy Cooperation Panel, a joint undertaking of WMO, IOC and all data buoy operators, makes constant use of the satellite-based location and data collection system, ARGOS (which flies on board the NOAA operational satellites), for data collection and platform location. This system will also be used in the next ARGO project, which deals with subsurface floats.

47. WMO issues an annual report on the status of implementation of the World Weather Watch. The report includes a section on the space-based portion of GOS, consisting of a network of geostationary and polar-orbiting satellites. The next report will be published in mid-2001. The status of satellite technology for application in meteorological observations and telecommunications is considered at each session of the WMO Commission for Basic Systems, which meets on a biennial basis. The last session of the Commission was held in late 2000.

### 2. Assessment and monitoring of the Earth's environment

48. The potential of support from space applications and services is always considered in the various ECLAC technical assistance missions and policy documents on subjects such as the implementation of the United Nations Convention on Biological Diversity.

49. ESCAP will develop and implement, within the framework of the minimum common programme of RESAP II, regional cooperative projects on space technology applications for environmental monitoring. In future years, when resources become available, ESCAP will implement common denominator projects that address environmental concerns of the member countries, including those on the following:

(a) Integrated spatial information for sustainable coastal zone management;

(b) Enhancing capacity for urban and rural development planning;

(c) Disaggregated poverty mapping for the region of Asia and the Pacific;

(d) Environmental monitoring and analysis for health care and hygiene.

50. ESCAP will conduct a regional cooperative research project on the utilization of data provided by the Advanced Earth Observing Satellite-II (ADEOS-II) for applications related to the Earth's environment, when resources become available.

51. ESCAP will hold the annual meeting of the Regional Working Group on Remote Sensing, Geographic Information System and Satellite-based Positioning in Hanoi in June 2001. The venue of the annual meeting in 2002 is to be determined.

52. Through its Division of Early Warning and Assessment and the Global Resource Information Database (GRID) network, UNEP maintains linkages with providers and users of remote sensing and information technology applications in many countries to support an assessment framework for reviewing the state of the global environment and environmental issues of international significance. The GRID network now consists of 15 centres. Four of them, the Environmental Assessment Programme for Asia and the Pacific (EAP.AP-Bangkok), GRID-Geneva, GRID-Nairobi and GRID-Sioux Falls, have a UNEP staff presence. GRID-Arendal is operated as a private foundation supported by the Government of Norway, through direct support to UNEP, in accordance with a memorandum of understanding between the partners. The other centres of the GRID network are at the following locations: the International Centre for Integrated Antarctic Research, Christchurch, New Zealand; the National Institute for Environmental Studies, Tsukuba, Japan; the International Centre for Integrated Mountain Development (ICIMOD), Kathmandu; the National Institute for Space Research (INPE), São José dos Campos, Brazil; the Canada Centre for Remote Sensing, Ottawa; Warsaw; the Ministry of the Environment, Budapest; the Blue Plan Office Regional Activity Centre of the Mediterranean Action Plan (MAP); Moscow, within the Russian Federation's Ministry of Natural Resources; and the Ministry of the Environment in Tbilisi. The results of activities of those centres are shared through the GRID network and archived at the regional GRID centres in Bangkok, Geneva, Nairobi and Sioux Falls.

53. Through its Division of Early Warning and Assessment, UNEP has embarked on a major new information system development in conjunction with the Environmental Systems Research Institute (ESRI) in Redlands, California, United States, and a number of other partners. This system, known as UNEP.net, will provide a single entry point of access to a vast array of environmental data and information and related output products available in various forms from UNEP and its assessment networks, as well as those from a number of close partner organizations. The development of UNEP.net was initiated at a meeting in Redlands in October 2000, where more than 30 persons from the Division of Early Warning and Assessment and other divisions of UNEP and ESRI conceived the system and planned its development. The system is based on Internet map server (IMS) technologies, such as "dynamic maps", and related state-of-the-art software technologies that serve to access, analyse and acquire environmental data and information, such as satellite imagery and related products, at various geographic resolutions and scales.

54. UNEP.net is a long-range strategic effort, but there is already an immediate and intensive campaign under way by the Division of Early Warning and Assessment and its various regional GRID and other centres to develop and bring on-line environmental data mapping services. These will initially be located at UNEP headquarters in Nairobi and gradually thereafter will be introduced in the various regions served by the organization. The prototype version of UNEP.net is already due to be presented to the Governing Council of UNEP at its twenty-first session, in February 2001. A medium-term build-up phase sees development of additional applications and the integration of services hosted at different UNEP and partner locations. That integration will emphasize extension of services across the entire UNEP programme to other divisions. By the end of 2001, UNEP.net is to enter a relatively stable operational period throughout most of the biennium 2002-2003. Towards the end of that period, by mid-2003, a cycle of review and evaluation will then lead to planning the next phase of service.

55. GRID centres continue to produce, add value to and disseminate data sets useful for environmental assessment. UNEP will place greater emphasis on bringing the centres closer together and is considering the creation of a steering committee to oversee the development of a more integrated operation. The GRID centres continue to serve as the foundation for UNEP Environment and Natural Resources Information Networking (ENRIN) projects, implemented by cooperation agreements with governmental and intergovernmental organizations in developing countries and countries with economies in transition to create environmental assessment and reporting networks. ENRIN projects are intended to promote the flow of information on environmental assessment between partner institutions and UNEP; provide for policy and planning consultations related to international environmental assessment and reporting; and provide a vehicle to catalyse and facilitate capacity-building of participating institutions.

56. GRID-Geneva, in cooperation with UNITAR, initiated a project entitled "GISWeb Africa" in 1999, as part of the Information Systems to Monitor the Environment through the Internet (SISEI) Africa project. The GISWeb Africa project, developed using a standard and well-known software, has two basic on-line functionalities, one for consultation, display and printing of georeferenced data and the other to query the data through logical and mathematical operators. The resulting application has been distributed on CD-ROM and the on-line version of the application was made available by the end of 2000.

57. Since mid-1999, GRID-Geneva has been conducting a project that aims to map marine pollution from land-based sources in Lebanon using remote sensing techniques. After a July 1999 mission to Lebanon, the project's objectives were extended to include the establishment of a general coastal information system. Partners of the project include the Lebanese Environment and Development Observatory within the Ministry of the Environment, the Lebanese Council for Development and Reconstruction, the National Centre for Remote Sensing and the Ministry of the Environment of Lebanon, as well as UNEP-MAP in Athens.

58. UNEP will continue to operate its North American node of GRID in cooperation with NASA, the United States Geological Survey (USGS), the United States Forest Service (USFS) and the United States Environmental Protection Agency (EPA).

59. Through GRID-Sioux Falls, UNEP will maintain access to the world-class expertise and unique facilities of the USGS Earth Resources Observation Systems

(EROS) Data Center (USGS-EDC), EPA, NASA and USFS, in the use of applied data and information technology for the benefit of developing countries. UNEP, through GRID-Sioux Falls, has been active in the design, development and timely delivery of scientifically credible information products, recognizing that it is a formidable challenge to provide decision makers with information useful for environmental planning, management and policy formulation in a timely manner and understandable formats. USGS-EDC is the largest satellite data centre in the world, with about 600 scientists. Extensive partnerships with the private sector, non-governmental organizations, scientific bodies and academic institutions have been established. The Center has an active programme dealing with integration and analysis of data sets from multiple sources to derive policy relevant information about freshwater, biodiversity loss, land cover changes and population-environment interactions. Activities include monitoring of environmental hot spots around the world using satellite data, early warning of emerging environmental threats in Africa, assessing the risks and threats to human health associated with the degradation of ecosystems, assessing the status of the world's remaining closed forests, rapid response to environmental emergencies, environmental vulnerability assessment and integrated river basin assessment.

60. GRID-Sioux Falls started an initiative related to a poster series entitled "Our Changing Environment" to document changes over the last 30 years using satellite data. The posters will incorporate satellite imagery, maps, ground photographs and text. The project goal is to educate policy makers and the general public about the environmental situation in specific locations throughout the world. Environmental topics may include water issues, deforestation, desertification, disasters, fires, urbanization and agriculture-related issues.

61. GRID-Sioux Falls continues its work on an assessment of the world's transboundary protected areas by geographical location and protection status. The basic goal is to identify the continental distribution of transboundary protected areas to provide a basis for international cooperation. By combining several factors, such as land cover and population density, it is hoped to identify transboundary protected areas that will be at highest risk of degradation in the future.

62. GRID-Sioux Falls continues its work on integrating ground-based data and spaceborne images for the assessment of transboundary movement of pollutants as an early warning system. It also continues to develop a Global Environment Facility (GEF) Programme Tracking and Mapping System. The project leverages advanced Internet technology to connect all GEF projects and enable them to communicate, exchange information and perform activities that cut across agency boundaries. The GEF secretariat's project tracking system was released on the GEF Web page under "project map" (http://www.gefweb.org/).

63. Through EAP.AP-Bangkok, UNEP distributes copies of the Asia-Pacific mosaic based on 1993 NOAA-advanced very high resolution radiometer (AVHRR) high-resolution picture transmission data obtained from USGS-EDC, the NOAA National Environmental Satellite, Data and Information Service, the National Research Council of Thailand, the State Meteorological Administration/Satellite Meteorology Centre of China, GRID-Tsukuba, the Centre for Environmental Remote Sensing of Japan and Chiba University in Japan. In addition, through EAP.AP-Bangkok, UNEP also distributes an Indian Remote Sensing Satellite (IRS) Wide Field-of-view Sensor (WiFS) mosaic for Cambodia, northern India, the Lao People's Democratic Republic, Myanmar and Thailand. EAP.AP-Bangkok, together with the EC Joint Research Centre, is conducting a research project to test the usefulness of VEGETATION data for forest cover monitoring in Indochina.

64. Through GRID-Nairobi, UNEP continues to implement the East African Coastal and Marine Environment Resources Database and Atlas Project, known as EAF/14. The overall objective of the project is to provide decision makers and the general public with a planning and management tool for developing their coastal resources. The project also aims to establish a GIS unit in collaborating agencies in each of the project countries, provide training in database management and GIS techniques and produce related printed materials (see A/AC.105/726, para. 67). All of those activities are to continue during the year 2001.

65. UNEP operates Mercure, a satellite-based telecommunications system operating through the International Telecommunications Satellite Organization (INTELSAT). Mercure is designed to improve global access to environmental information and

provides key infrastructure for the UNEP environmental information Internet, UNEP.net. It uses INTELSAT satellites in geosynchronous orbit over the Indian and Atlantic Oceans. Six high-capacity Earth stations operating at six cities around the world are serving information management needs of national and regional environment authorities and UNEP headquarters and regional offices. Nine lower-capacity stations established in nine cities around the world are serving information management needs of national environment agencies.

66. Consistent with the objectives of chapter 40 of Agenda 21, UNEP also operates UNEP.net, an international environmental Internet targeted at meeting the information management needs of UNEP partners and users of environmental information worldwide. Mercure ensures the viability of UNEP.net in developing countries and in countries with economies in transition by providing satellite telecommunications for global delivery of environmental information products. Modern and cost-effective data communications through UNEP.net and its links to the global Internet provide access to comprehensive information on the environment and sustainable development. UNEP.net supports the UNEP Intranet system with connections to national focal points

67. The UNEP Regional Office for West Asia is supporting the Regional Organization for the Protection of the Marine Environment (ROPME) in the establishment of a remote sensing receiving station for the ROPME sea area. The station would provide data on the characteristics and dynamics of natural freshwater, coastal and marine resources and habitats and the ongoing discharges of oily and other wastes into the marine environment through the acquisition of satellite data on a region-wide scale and provide information and/or image analyses and interpretation to member States. Using RADARSAT space technology coupled with the European Remote Sensing (ERS)-1 and 2 satellites and NOAA-AVHRR, the station would provide the region with a powerful system that has a wide geographical coverage, longer observation time and the ability to observe and track oil spills for a longer period and to map and follow up coastal changes, assess habitats, measure oceanographic parameters, such as chlorophyll, temperature and turbidity, and map terrestrial ecosystems. Training and exchange of experience and expertise in the region is another major objective of the project in establishing the station. The Organization of the Petroleum Exporting Countries and the Arab Fund for Economic and Social Development have approved contributions for the station. UNEP and ROPME are in discussion with the Islamic Development Bank and GEF on developing the proposal further in order to meet their funding conditions. Emphasis has been placed on the benefits of the project in protecting biodiversity and commercially important species of fish and shrimp and on the linkage between the station and existing national centres. A greater commitment by member States to the operational phase of the project was also considered necessary.

68. The first product of the cooperation between ROPME and UNEP in this area is an atlas on the ROPME sea area, published in November 2000 and entitled "ROPME From Space", describing habitats, other ecological features and human activities in member States.

69. The UNEP Regional Office for West Asia, ROPME, the Arab Centre for the Studies of Arid Zones and Dry Lands (ACSAD) and GRID-Geneva and GRID-Sioux Falls are carrying out an assessment of the state of the waters in western Asia. Each of the parties is providing input, with ACSAD providing the data and report. ROPME is to analyse the data and produce a report on the state of the coastal and marine environment, with GRID providing 43 Landsat satellite images to assist in the surveys.

70. The first phase of the project deals with the Tigris-Euphrates basins and is entitled "Evaluation of Land Cover Changes in the Tigris-Euphrates Basins and the Wetlands of Lower Mesopotamia, in the Arabian Gulf and the Coast of Oman". The international river system shared by seven countries has attracted growing international attention in recent years owing to serious water stress facing the arid region, compounded by surging populations and ambitious development plans. The basin, considered to be on the brink of what have been popularly termed "future water wars", vividly illustrates the linkages between the environment and security issues. After providing a basin-wide assessment of transformations that have occurred in the watershed in the twentieth century, the study focuses on two key hot spots that have witnessed the greatest changes in the last decade. These are the headwater region in Turkey, where mountain valleys and terrestrial ecosystems have been inundated by a

series of reservoirs created by a succession of large dams, and the Mesopotamian marshlands, located downstream in southern Iraq and extending into the Islamic Republic of Iran. Originally covering an estimated area of 15,000-20,000 square kilometres, these marshlands are of global significance and constitute the largest wetland ecosystem in western Asia. Situated in the lower basin, the marshlands are particularly vulnerable to developments upstream and have been devastated by massive drainage schemes.

71. In the second phase, an assessment of the state of coastal wetlands in the ROPME sea area will be made. There is an important linkage between the ROPME sea area and the Tigris-Euphrates river system, connected not only hydrologically by the Shatt al-Arab waterway, but also through the migration of aquatic species. Many coastal wetlands in the ROPME sea area have been damaged by urban and agricultural developments, oil spills and military conflict. ROPME will carry out analysis of satellite imagery provided by GRID-Sioux Falls.

72. As an associate member of CEOS and under the umbrella of its virtual network, UNEP is negotiating with peer networks to further extend environmental information services provided by UNEP.net/Mercure. Environmental satellite telecommunications can be extended to the small island developing States of the Pacific. UNEP.net/Mercure can offer access to remotely sensed data for management of marine resources and for environmental legislation.

73. UNEP.net/Mercure also provides a number of CEOS-related information services intended to increase environmental applications of Earth observation data. UNEP hosts sites of the CEOS International Directory Network (IDN) in Hungary, Kenya and Switzerland. UNEP is also adopting the CEOS Information Locator System (CILS) as a core item of its information servicing infrastructure. UNEP will in future be working to implement gateways for the Catalogue Interoperability Protocol (CIP). IDN, CILS and CIP are all outcomes of the Working Group on Information Systems and Services. Furthermore, UNEP is very active in CEOS-based activities relating to metadata for spatial data, including Earth observation data sets. UNEP now represents the Working Group in the technical committee on spatial metadata of the International Organization for Standardization (ISO). UNEP will continue to promote the exchange of data and other information through the Global Environmental Information Exchange Network (INFOTERRA), which supports a number of clearing-house mechanisms and maintains a subscription list for environmental queries and a Gopher node on the Internet.

74. An agreement was signed in June 2000 between UNEP, the Government of the United Kingdom and the World Conservation Monitoring Centre (WCMC), designating the latter institution a UNEP "centre of expertise" for biodiversity and conservation.

75. UNEP continues to provide technical backstopping assistance to Eritrea, Ghana, Kenya, Lesotho, Uganda, the United Republic of Tanzania and Zambia. Continuing cooperation in the development of environmental information systems in Africa is coordinated through the Advisory Committee on Environmental Information Systems in Sub-Saharan Africa. Sponsored by the World Bank, UNEP, the UNDP Office to Combat Desertification and Drought, the German Agency for Technical Cooperation (GTZ), USAID and the Norwegian Agency for International Development, the Advisory Committee provides a forum for coordination and the exchange of ideas.

76. UNEP also cooperates with the FAO Regional Office for Africa in Accra in strengthening institutional capacities for developing coastal and marine environmental databases for some countries along the west African coast, such as the Gambia, Ghana and Guinea.

77. Through GRID-Arendal, UNEP is continuing to maintain the Baltic Sea catchment area database. The database can be accessed through the Internet and the World Wide Web.

78. Through its Global International Waters Assessment (GIWA) office in Kalmar, Sweden, and supported by GRID-Arendal, UNEP will maintain an international water assessment gateway within the framework of UNEP.net. Also through GRID-Arendal, UNEP will further develop a gateway to Arctic environmental and natural resource data and information sources, in close cooperation with the working groups under the Arctic Council and the Arctic research community. In cooperation with other United Nations agencies and organizations and through GRID-Arendal, UNEP will develop the first global assessment on loss of biodiversity due to human

activity, based on recently available global GIS data sets.

79. UNEP continues to work through EAP.AP- and GRID-Bangkok on the following collaborative undertakings:

(a) Coastal and Marine Environmental Management Information System for the South China Sea Area, covering Cambodia, southern China and Viet Nam;

(b) Further development of the North-West Pacific Action Plan of the UNEP Regional Seas Programme.

80. Subject to the availability of finances, UNEP will continue to seek opportunities to offer short-term fellowships to appropriate persons from developing countries to work at GRID-Sioux Falls and to develop or analyse data sets relating to environmental issues in their home countries.

81. UNEP and UNESCO will continue to work with the ICSU Scientific Committee on the Problems of the Environment.

82. UNHCR is currently developing a framework for environmental assessments and monitoring methodologies using a combination of traditional field surveys, satellite imagery and GIS to develop indicators for undertaking sound environmental projects. The project is supported by the French Fund for the Global Environment and UNHCR.

83. FAO is evaluating the potential of the Land Cover Map and Geodatabase for Africa (AFRICOVER) databases, including the Land Cover Classification System (LCCS), to support the implementation of the international environmental conventions, in particular the United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, particularly in Africa. FAO participates in international meetings on the use of information systems within the framework of the Convention and, at the request of its Executive Secretary, prepared a concept paper on the design of a new important global initiative called the Overall Assessment of Desertification (OAD). The conceptual phase of the programme, Land Degradation Assessment (LADA), to be executed by FAO with GEF funding, was approved in June 2000. An international expert meeting was held in this context at FAO in early December 2000. FAO maintains a Web site on desertification (http://www.fao.org/desertification/), which contains, among many other modules, a global geo-reference database on parameters related to desertification. The database, in combination with other FAO activities related to information systems on desertification, may be extended progressively to form a technical support service for national and regional organizations and programmes in implementing the Convention, depending on the availability of external funding resources. FAO has also offered its technical support to the recently launched Asian Convention to Combat Desertification thematic network, "TPN1" on desertification assessment and monitoring.

84. Within the framework of the Man and Biosphere Programme (MAB), UNESCO will continue to cooperate with UNEP, FAO, WMO and the ICSU International Geosphere-Biosphere Programme (IGBP) concerning GTOS, notably through its World Network of Biosphere Reserves (391 sites in 94 countries). Two initiatives are at present being developed, the first of which deals with the use of biosphere reserves as ground truth sites for the GTOS project on net primary productivity, which is coordinated through the international long-term ecological monitoring programme, in cooperation with NASA. Additionally, 125 biosphere reserves have been selected for possible inclusion in the GTOS terrestrial ecosystems monitoring sites (TEMS) exercise. The second is the development of a biosphere reserve integrated monitoring (BRIM) programme aimed at integrating biodiversity, environmental and social monitoring within biosphere reserves and related findings, including information obtained by remote sensing and GIS applications.

85. Within the framework of the MAB programme, UNESCO will continue to cooperate with the Sahara and Sahel Observatory (OSS) in the creation of an ecological observatory network, ROSELT, in Africa. UNESCO will assist, in particular, in introducing the use of space technology for monitoring fragile ecosystems in dry lands, semi-arid and arid regions. Also within the framework of the MAB programme, UNESCO will launch during the International Year of the Mountains, in 2002, interdisciplinary research projects with remote sensing and GIS components for the study of methodologies for rehabilitation of mountain ecosystems.

86. UNESCO, ICSU and several ICSU affiliates are sponsors of the Diversitas Programme on biodiversity science. The year 2001 has been declared International Biodiversity Observation Year, for which a number of activities are being promoted worldwide, many of which use remote sensing technologies and GIS applications.

87. The UNESCO World Heritage Centre is exploring possibilities with the NASA Earth Studies Unit and other bilateral agencies concerned with remote sensing possibilities for using archived and new satellite and remote sensing images for the study of land cover changes in and around a selected number of world heritage sites, with a view to assessing the extent of habitat fragmentation and any threat of biological isolation. The results of their discussions will be known during 2001.

88. In cooperation with the International Institute for Aerospace Survey and Earth Sciences (ITC) and the World Wildlife Fund, UNESCO is developing a training programme on remote sensing and GIS for the rehabilitation of panda habitats in China. The training programme is for both scientists and managers.

89. ITU will participate in two pilot projects initiated by Tunisia entitled "Establishment of a terrestrial and space telecommunications infrastructure for an integrated information system on the environment and sustainable development in Tunisia" and "Establishment of a satellite-based network for the remote monitoring of sea water quality".

90. In collaboration with UNITAR, the ITU Telecommunication Development Bureau has organized several subregional training seminars in Africa on the development and use of telecommunication and information technology for protection of the environment and sustainable development. The Bureau will collaborate with OSS and UNITAR for the implementation of the second phase of the Environmental Information System on the Internet for Africa (EISIA).

91. WMO continues to provide valuable data and assessments concerning atmospheric status under the Atmospheric Research and Environment Programme through GAW, which it established in 1989 as a long-term monitoring and research system to detect changes in the composition of the atmosphere on global and regional scales. Work includes monitoring and research on pollutants, acid deposition and greenhouse gases, including ozone, aerosols and other trace substances in the atmosphere that may lead to global climate change. GAW data include surface and vertical observations, which provide the information required to verify satellite-based measurements of selected atmospheric constituents. In particular, through its more than 150 total ozone monitoring stations, GAW has furnished critical ground truth data to calibrate ozone observations from space. Those satellite observations, in turn, provide vital information used in the preparation of near real-time ozone bulletins on the state of the ozone layer during both the austral spring and the northern hemisphere winter. In addition, using four-dimensional variational assimilation techniques, major global numerical weather forecasting centres are starting to assimilate real-time ozone observations from satellites as well as ground-based measurements, in order to improve the analysis of stratospheric winds and ozone radiative effects. Such activities will benefit from better cooperation with space observing programmes and, in that respect, a new joint CEOS/WMO initiative has been developed concerning the monitoring of ozone. Such collaboration will be further extended to the monitoring of other atmospheric chemical components, such as greenhouse gases, as a more general contribution to a new atmospheric chemistry theme within IGOS.

### 3. Management of natural resources

92. The ECE Environment Division will further develop the use of remote sensing and GIS for land use/land cover information.

93. The potential of support from space applications and services is always considered in the various ECLAC technical assistance missions and policy documents on subjects such as watershed management, integrated coastal zone management, land management for tourism, local sustainable development and marine resource evaluation and management.

94. Within the framework of the minimum common programme of RESAP II, ESCAP will develop and implement regional cooperative projects on space technology applications for natural resource management. ESCAP, in close cooperation with FAO, will also implement in 2001 and beyond the common denominator project on development and applications of a multi-purpose environmental and natural resources

information base for food security and sustainable development in the ESCAP region. When resources become available, ESCAP will also develop and implement common denominator projects for the sustainable management of natural resources of its member countries, including those on the following:

(a) Integrated land and water resource management;

(b) Crop monitoring and agricultural production forecasting in the ESCAP region;

(c) Potential off-shore fishery area delineation and inland aquaculture development;

(d) Mapping for groundwater potential and identification of recharge zones;

(e) Joint research on precision farming and cropping system analysis.

95. Through GRID-Geneva, UNEP continued work on a project related to biodiversity mapping in Madagascar. The broad objective of the project is to develop a method to map and qualify biodiversity, which will be part of an efficient and user-friendly GIS to manage biodiversity data in relation with other environmental information, for instance the location and intensity of forest and wildfires. The more specific aims of the project are: (a) to examine different methodologies used for land cover mapping (such as LCCS); (b) to make existing land cover data comparable and thus more effective for analyses of land cover and land cover changes at the regional or global levels; and (c) to derive biodiversity-related information from land cover maps. In order to achieve this, GRID-Geneva is producing a land cover and biodiversity map for the northern part of Madagascar.

96. Through EAP.AP-Bangkok, UNEP continues to undertake land cover assessment and monitoring studies with subregional and national agencies. It has completed the assessment and monitoring of 13 countries and is currently performing land cover analysis of Sri Lanka using data from IRS WiFS. UNEP has also prepared through EAP.AP-Bangkok a new publication on land use/land cover change in south-east Asia, which is being distributed free of charge. A compact disc containing data and publications relating to land cover projects has been prepared and is now available on request. The same contents of that compact disc are also available online on the EAP.-AP Web site (http://www.eapap.unep.org/lc/cd/html/assess_monitor.html).

97. Having completed the World Soils and Terrain Digital Database (SOTER) on the scale 1:5,000,000 for Latin America, UNEP, together with the International Soil Reference and Information Centre and FAO, continues to advance the work on and coverage of SOTER.

98. FAO cooperates with the regional commissions of the United Nations and regional and national remote sensing centres and environmental agencies in the development and efficient use of remote sensing and GIS technology for mapping, assessment and monitoring of renewable natural resources and studies of land resource dynamics. Priorities have been reoriented to focus on capacity-building for the implementation of the recommendations of Agenda 21 and the recommendations of the World Food Summit, held in Rome in November 1996, as well as the international environmental conventions on desertification, biodiversity and climate change, including the Kyoto Protocol.

99. Following the successful completion of Phases I and II of the FAO/USAID project on the monitoring, forecasting and simulation of the Nile River, FAO implemented Phase III of the project during the period from 1997 to May 2000 to assist the Government of Egypt in consolidating the results achieved in the earlier phases. Phase III of the project focused on further consolidation of the Nile River Monitoring and Forecasting System. The related control/decision support system has been approved and implementation of the system commenced in 1998. In relation to this programme, the first phase of a capacity-building programme for the management and development of the Nile resources, covering the entire Nile basin, has been completed and is presently being followed by a second phase, supported by the Government of Italy, with emphasis on (a) regional basin management and planning; (b) legal and institutional development; and (c) planning and implementing sub-basin action programmes.

100. In addition to global and regional projects, the FAO Environment and Natural Resources Service is currently executing or providing technical backstopping to some 35 field projects with a major remote sensing, GIS and information management system component in Africa, Asia, Latin America and the Caribbean and central and eastern Europe. Projects are

taking place in, inter alia, Afghanistan, Azerbaijan, Bangladesh, Bulgaria, Brazil, Burundi, Eritrea, Lithuania, Pakistan, Peru and Tunisia. FAO is also actively involved in developing and field-testing new remote sensing methodologies through pilot projects in a number of countries, including inventory and monitoring of shrimp farms in Sri Lanka, wetlands mapping and assessment in Zambia using synthetic aperture radar (SAR) data of ERS and groundwater exploration in the Syrian Arab Republic using satellite remote sensing combined with GIS technology. In countries with economies in transition, FAO offers advice on the use of remote sensing and GIS in planning and implementing agricultural land reform and in assessing and monitoring environmental damage. At present, such assistance is being provided to Albania, the Czech Republic, Hungary, Poland and Slovakia.

101. The FAO Environment and Natural Resources Service has operated the AFRICOVER project since 1995. The project aims to establish a digital land cover database for selected subregions in Africa. It produces land cover maps on the scale 1:250,000 (1:1,000,000 and 1:100,000 in certain cases), using the same geographical references and projection system in Africa, as well as a common harmonized legend, with updated information on features including drainage, toponymy, roads and land cover. The project has been implemented through close cooperation between regional and national remote sensing centres and mapping agencies in Africa under the supervision of FAO. A further two-year phase of the AFRICOVER East Africa project was approved by the Government of Italy in August 2000 with a focus on the application of access to and distribution of established AFRICOVER datasets and application of the LCCS methodology at the national, regional and global levels. FAO also cooperates with the EC Joint Research Centre, UNEP and UNESCO by participating in working groups on the harmonization of land use and land cover classification.

102. Since 1996, the World Bank and FAO have been implementing the Regional Environmental Information Management Project (REIMP), a regional project in central Africa. The project aims at improving and strengthening the planning and management of natural resources in the countries of the Congo basin by providing the various stakeholders with appropriate environmental information. The project involves some 100 organizations from the public, private and non-governmental sectors, which all work in a national and regional network structure. FAO is the lead agency for the normative as well as the technical control activities of the project, which is supported by a multi-donor fund of more than $10 million involving Belgium, Canada and France and the World Bank, the European Union and GEF. The main recent activities of the project include (a) the preparation of a number of geodatabases and reviews on the environment, forest and land use; (b) capacity-building, provision of equipment and training; and (c) establishment of Internet-based thematic networks on the main environmental priorities of the subregion (biodiversity, forestry and coastal zones). Particular attention is given in the project to involving the users of information at all decision-making levels. UNHCR is a partner within the framework of the project and will provide standard procedures and integrate geographical information for refugee contingency planning activities.

103. In cooperation with a number of partners and with financial support from the European Union, the FAO Environment and Natural Resources Service designed the Integrated Coastal Assessment and Monitoring System (ICAMS), which will support the management of coastal area ecosystems through the monitoring of water quality, distribution of coastal resources and usage parameters from multiple Earth observation data, such as satellite data from SeaWiFS and future Envisat sensors, as well as in situ measurements. Such a system will provide data of appropriate spatial and temporal scales to address issues concerning coastal management, such as the origins, causes and implications of changes in coastal water quality on associated resources. The operational viability of the ICAMS approach is currently being demonstrated through pilot applications at three European sites that address a range of coastal management issues: monitoring eutrophication in the Po estuary (Adriatic Sea, Italy); a study of fishery oceanography in the northern Aegean (Greece); and risk assessment of "red tides" in Bantry Bay (Ireland). Efforts are also under way to apply the ICAMS concept to address coastal area management issues in the Nile Delta in Egypt as well as in test sites in Albania and Tunisia.

104. The 1990 forest resources assessment (FRA) project of the FAO Forestry Department, a global survey of forest resources, demonstrated that, with the

help of remote sensing, information on changes in forest and land use could be obtained on a pan-tropical basis in a cost-effective, timely and statistically sound manner. FAO concluded that such surveys, if continued over time, would lend factual support to global environmental researchers and policy makers by providing descriptions of the processes of change and the quantification of essential parameters on a reliable basis. In view of the information needs of the international community, in particular the need for studies on global changes, FAO has decided to continue to implement FRA on a regular basis in order to build consistent and reliable time series observations of forest and land use. FAO is currently executing the global forest resource assessment for the year 2000, FRA 2000, which relies on the use of remote sensing for many of its components, ranging from coarse resolution global coverage for land cover mapping to high- and very high-resolution multi-data satellite imagery for surveying global and regional forest and land cover changes. FRA 2000 includes an active country capacity-building activity, allowing countries to participate actively in the assessment process. The Government of Finland and the FAO regular programme are supporting the remote sensing component of FRA 2000. Cost-sharing arrangements for the low-resolution mapping component have been made with the EROS Data Center of the United States Geological Survey.

105. With the Government of the Netherlands, FAO has developed a Forest Assessment and Monitoring Environment (FAME) concept. The programme aims at defining, developing and implementing a dedicated operational end-to-end satellite remote sensing capacity to provide real-time access to appropriate remote sensing data for supporting sustainable forest management at the sub-national level, complementary to the FRA programme. During 1998, FAO contributed to a comprehensive FAME user requirements study, coordinated on behalf of the Government of the Netherlands by ITC, and its final report and eight related technical documents were published in June 1999. A follow-up programme, entitled "Establishment of operational use of spatial data in forest and forest lands assessment and monitoring environment (FLAME)", focusing on coordinated capacity-building to support sustainable forest management at the local and national levels, is presently under discussion between the Government of the Netherlands and FAO in the context of a new Netherlands/FAO partnership programme starting in 2001.

106. Under the coordination of its central GIS Unit, housed in the Environment and Natural Resources Service, and in cooperation with its relevant technical divisions, FAO has developed and is using several pilot GIS databases to evaluate marine resources, integrated terrain units and water basins in Africa.

107. FAO implements a number of GIS analysis and applications projects. These include (a) preparation of the GIS vector and raster versions of the FAO/UNESCO soil map of the world; (b) estimation of available arable lands for the major FAO study entitled "Agriculture Towards 2010"; (c) analysis of the suitability of inland aquaculture sites of Africa and South and Central America for fish farming potential; (d) soil suitability analysis studies for various crops in Africa; and (e) a dominant land resource map for Africa.

108. FAO envisages the increasing use of GPS in surveys and the integration of remote sensing data into GIS-based land resource information systems. FAO is considering using remote sensing to assess and monitor the progress of soil and water conservation works carried out in the field within the framework of national programmes assisted by the World Food Programme (WFP). To assist in the dissemination of information on remote sensing and GIS technology applications, FAO produces technical publications relating to land-cover classification systems, environmental indicators, coastal management guidelines and agro-climatological databases.

109. The UNESCO Division of Earth Sciences will continue to carry out the Pan-African Network for a Geological Information System (PANGIS) project, which aims at standardizing the geoscience databases of the region to facilitate the collection, exchange and retrieval of data for better management of resources and sustainable planning. A similar project was recently launched in Asia known as the South-East Asian Network for a Geological Information System (SANGIS); a regional meeting will be held in 2001 to finalize technical inputs and start the implementation phase. The above projects are being carried out by UNESCO in cooperation with the Commission on the Management and Application of Geosciences Information of the International Union of Geological

Sciences (IUGS), the International Centre for Training and Exchanges in Geosciences and the Royal Museum of Central Africa, Belgium.

110. UNESCO will continue to support in 2001 beyond international postgraduate courses on remote sensing and GIS technologies, including digital image processing, for mineral resource management, coastal zone management and geomorphological surveying and investigations. These courses are organized by ITC in the Netherlands.

111. UNESCO will assist in strengthening the remote sensing and GIS infrastructure of the Libyan Arab Jamahiriya through the organization of research projects and training courses to improve the study of the country's hydrological and geological resources.

112. Within the framework of the MAB programme, UNESCO will continue to organize training courses on remote sensing and GIS technologies for biosphere reserve managers in developing countries and to develop pilot projects on the operational use of GIS. Remote sensing and GIS technologies were introduced in biosphere reserve management by UNESCO in cooperation with Conservation International, Intel (United States) and the Nippon Electric Company (Japan).

113. The UNESCO Coastal Regions and Small Islands Unit of will continue to organize regional training courses on the applications of remote sensing data to marine studies using Bilko image-processing software. Within the framework of its training and education in marine science programme, the Unit will also:

(a) Continue to disseminate distance learning modules on applications of satellite and airborne image data to coastal management to educational institutions in CD-ROM and through the Internet;

(b) Disseminate a remote sensing handbook for tropical coastal management in 2001;

(c) Produce in 2001 a new module (Bilko for Windows) on the uses of multi-sensor, multi-temporal remote sensing data sets for monitoring dynamic coastal processes of erosion and accretion.

114. The World Water Assessment Programme (WWAP), a United Nations system-wide programme whose secretariat is housed within the UNESCO Division of Water Sciences, will make considerable use of remote sensing and GIS technologies such as in the assessment of surface water, soil moisture, groundwater distributions both for water availability and for assessing the impact of floods and droughts, and assessment of uses of water, such as forestry and agriculture. GIS will be used extensively as a tool for data intercomparisons within specific geographical units, for example, overlaying of water availability maps with maps of water use.

115. In the framework of the joint UNESCO/IUGS Geological Applications Remote Sensing (GARS) programme, the UNESCO Division of Earth Sciences will launch a new project in the Arab region in 2001 that will focus on the study of geological parameters influencing desertification and on transboundary groundwater aquifers.

116. Within the framework of the International Hydrological Programme, UNESCO is cooperating with the International Association of Hydrological Sciences in the organization of the Third HydroGIS Conference, which will be held in Vienna in 2001. The conference will disseminate new information and experiences in the uses of GIS in hydrology and water resource development.

117. UNESCO, FAO, the International Association of Hydrogeologists and ECE launched a research programme on internationally shared aquifer resources management, which will have important remote sensing and GIS components. The programme will draw on expertise in data fusion from the GARS programme and utilize geological mapping information collected through cooperation by UNESCO with Carte géologique du Monde for the compilation of geotechnical maps on a continental scale.

## B. Using space applications for human security, development and welfare

### 1. Enhancing disaster reduction capability

118. The IGOS partnership, including CEOS members and associate members such as FAO, ICSU, IOC, UNEP, WMO and IGFA, endorsed the Disaster Management Group, established under CEOS, to continue its work on disaster management and supported the close interaction with the secretariat for ISDR and the Office for Outer Space Affairs on the subject matter.

119. On the basis of the legacy of the International Decade for Natural Disaster Reduction, the General Assembly adopted resolution 54/219 of 22 December 1999 on the launching of the International Strategy for Disaster Reduction (ISDR). The new programme marks a decisive step in a system-wide attempt to activate an inter-agency, multi-sectoral and inter-disciplinary mechanism to implement effective disaster reduction measures in the twenty-first century. The overarching objective of the ISDR programme is to proceed from protection against hazards to the management of risk through the integration of risk prevention into sustainable development, thus enabling vulnerable communities worldwide to become disaster-resilient. The work modalities of the ISDR programme are illustrated in the report of the Secretary-General of 1 November 1999 (A/54/497).

120. The secretariat for ISDR continues to give high visibility to the potential applications of satellite techniques for risk management and disaster reduction and pays increasing attention to developments in that domain. For example, in 2000 ISDR concluded an agreement for inter-agency collaboration with the Office for Outer Space Affairs by exchange of letters. Pursuant to that agreement, the secretariat for ISDR and the Office for Outer Space Affairs share information and cooperate on programmes and activities involving the use of satellite applications for disaster reduction.

121. With reference to the use of remote sensing, Earth observation and other satellite-based techniques for reducing the impact of natural and similar disasters, ISDR is continuing its efforts to contribute to the definition of user requirements being undertaken by several organizations both within and outside the United Nations system. In doing so, the secretariat for ISDR concentrates on strengthening international partnerships within the international satellite community as well as between the latter and national organizations and civil society. The aim of the process is to increase the effectiveness of satellite techniques in countering the adverse effects of natural hazards, taking advantage of the growing profile that space applications enjoy within the disaster reduction and emergency management domains.

122. "The Space Millennium: Vienna Declaration on Space and Human Development,"[1] adopted by UNISPACE III and endorsed by the General Assembly in its resolution 54/68, called for action, among other things, to implement an integrated, global system, especially through international cooperation, to manage natural disaster mitigation, relief and prevention efforts, especially of an international nature, through Earth observation, communications and other space-based services, making maximum use of existing capabilities and filling gaps in worldwide satellite coverage. In response to that call, the Office for Outer Space Affairs, within the framework of the United Nations Programme on Space Applications, has undertaken to organize a series of workshops on the use of space technology in support of disaster management. The objectives of the workshops are (a) to increase the awareness of managers and decision makers involved in disaster management of the potential benefits and the cost-effectiveness of using space technologies; (b) to determine the types of information and communications needed in managing specific disasters and the extent to which they could be provided using space technologies; and (c) to develop a blueprint of actions that could lead in the near future to pilot projects whereby interested national institutions responsible for disaster management incorporate and test the use of space tools. The pilot projects would be designed and carried out through international cooperation. The process will seek to establish synergies among initiatives that are being carried out on the same theme by various institutions or groups of institutions.

123. The first in the series of workshops was organized in La Serena, Chile, from 13 to 17 November 2000, with the co-sponsorship of the European Space Agency (ESA) and the Government of Chile, for the benefit of countries of Latin America and the Caribbean (see the report of the workshop (A/AC.105/747). The participants identified 16 disaster themes, including forest and grassland fires, earthquakes and tsunamis, volcanic eruptions, flooding, cyclones, droughts, landslides, impact to marine and coastal systems, and oil spills. For 13 of the 16 themes, at least one institution involved in disaster management was willing to become leader of a team that would develop a pilot project proposal. It is anticipated that several pilot projects could be undertaken in the near term. Similar workshops are being planned for 2001 and 2002 for the regions of Africa, Asia and the Pacific and central and eastern Europe.

124. In 2001, the Office for Outer Space Affairs, within the framework of the United Nations Programme on

Space Applications, will organize a training course on the use of the international satellite systems for search and rescue for the benefit of Asia and the Pacific, in Bangalore, India.

125. ISDR is committed to cooperate with the Office for Outer Space Affairs in the implementation of the United Nations Programme on Space Applications and to participate in relevant workshops being organized to identify pilot projects for the use of space technologies in disaster reduction and emergency management, especially in developing countries. ISDR is involved in the Programme also through its network of national committees, which is constantly informed of developments in this domain through the public information activities carried out by ISDR on a regular basis.

126. In collaboration with El Colegio de la Frontera Sur, Mexico, UNHCR is finalizing a project using satellite images, GPS and GIS to monitor the environmental changes around refugee settlements in Chiapas, southern Mexico.

127. UNHCR, as part of the EC-supported project on environmental monitoring of refugee camps using high-resolution satellite images, is developing standards on how to use satellite images for humanitarian activities. The project also includes the use of data from new very high-resolution satellites, such as Ikonos, for refugee operations

128. The United Nations Geographic Information Support Team is an inter-agency working group, the aim of which is to improve coordination and inter-agency response in the field of geographic information during humanitarian emergencies, in particular by developing standards and improving information-sharing among operational partners and with Governments. The Support Team has developed the SHARE framework for practical guidelines and coordination of inter-agency information-sharing. The working group consists of UNHCR, FAO, WFP, the United Nations Children's Fund (UNICEF), the Office for the Coordination of Humanitarian Affairs and donors. Within the United Nations Geographic Information Support Team, UNHCR, in close collaboration with the United Nations Office for the Coordination of Humanitarian Affairs, UNICEF, FAO and WFP is currently undertaking a survey on how satellite images are used by United Nations humanitarian agencies.

129. Following the humanitarian relief operation in Kosovo, the United Nations Geographic Information Support Team reviewed lessons learned in inter-agency geographic activities, including the use of GPS and remote sensing. These are set out in the SHARE document. In the context of the Kosovo operation, UNHCR has developed specific lessons learned in the use of geographic information and related tools within humanitarian emergencies.

130. Specific recommendations regarding the use and sharing of satellite information in United Nations humanitarian relief agencies are currently being developed by UNHCR in cooperation with other United Nations agencies. Those recommendations will be finalized in 2001.

131. UNHCR has been a key member of the Global Disaster Information Network (GDIN) since its launch in 1998 and together with UNICEF leads workshops on standards for GIS and satellite images. The Network is a forum where satellite data providers, value-added service industries, software providers and representatives of disaster relief organizations are introduced to the latest updates and can develop links for information-sharing with the aim of providing more efficient services to the disaster relief community.

132. UNHCR, in close collaboration with its field offices around the world, is maintaining a GIS database with GPS coordinates of refugee locations (camps, settlements, centres and accommodations according to UNHCR typology) around the world. The database is continuously updated according to the evolving refugee situations.

133. UNHCR is utilizing satellite imagery for environmental assessments in several refugee camps in Nepal. This is done in close cooperation with governmental authorities. Together with the Ethiopian Mapping Agency, UNHCR is also assessing environmental changes using satellite imagery in western and eastern parts of Ethiopia linked to the presence of refugee camps.

134. UNHCR and the European Union, in cooperation with the Government of the United Republic of Tanzania, are funding a project there that focuses on developing a GIS database for improved contingency planning.

135. UNHCR is finalizing a technical memorandum of understanding with WFP in the field of geographical

information and related tools for humanitarian activities.

136. UNHCR is providing training to emergency personnel on the use of GPS and benefits of GIS and satellite imagery.

137. The potential of support from space applications and services is always considered in the various ECLAC technical assistance missions and policy documents on subjects such as prevention strategies for the effects of natural hazards.

138. The ESCAP Regional Working Group on Space Science and Technology Applications will, as agreed at its annual meeting in 2000, undertake new common denominator projects under the second phase of RESAP, including one on investigation of infrared technology for fire detection in Asia and the Pacific.

139. Within the framework of the minimum common programme of RESAP II, ESCAP will develop and implement, when resources become available, regional cooperative projects on space technology applications for natural disaster monitoring and mitigation at the national and regional levels, including on the following:

(a) Capacity-building for disaster management;

(b) Technology cooperation for the development of inexpensive ground receiving and processing stations for meteorological satellite direct broadcast data;

(c) Joint regional research on monsoons.

140. ESCAP will hold the annual meeting of the Regional Working Group on Meteorological Satellite Applications and Natural Hazards Monitoring in Kuala Lumpur in April 2001. The venue of the annual meeting in 2002 is yet to be determined.

141. ESCAP will facilitate under the Dialogue Forum the development and implementation of a regional cooperative project among member countries on a space-based disaster monitoring system involving a constellation of small satellites.

142. EAP.AP-Bangkok is initiating a project to monitor glacier lake outburst flooding in the Hindu Kush and the Himalayas, together with ICIMOD and relevant national agencies, and, together with the National Institute of Aeronautics and Space (LAPAN) of Indonesia and the Malaysian Centre for Remote Sensing (MACRES), is preparing a 1:250,000-scale GIS database on the islands of Borneo and Sumatra that will eventually be used to prepare fire-hazard maps and a forest fire danger-rating index.

143. Through EAP.AP-Bangkok and GRID-Sioux Falls, UNEP is cooperating with UNDP in a GIS remote sensing assessment of the Democratic People's Republic of Korea relating to agricultural relief and rehabilitation following recent disasters.

144. Through GRID-Sioux Falls, UNEP completed a number of publications relating to the integration of Earth observation and socio-economic data to address environment and development interactions, including a report entitled "Satellite Earth observation in wildfire management", as co-chair of the CEOS disaster management support project.

145. Starting in 1998-1999, when forest fires and wildfires broke out at locations around the world, GRID-Geneva prepared a Web site, which is regularly updated, linking relevant information from existing sources on the World Wide Web such as ESA, NASA, NOAA and national meteorological agencies. The aim of the project is to summarize and disseminate available information on wildfires worldwide. The Web site now provides a bi-weekly report and includes maps and images downloaded from the Internet, which are in some cases further refined or produced by GRID-Geneva. At the same time, status reports on the fires have continued to be provided to the United Nations Office for the Coordination of Humanitarian Affairs in Geneva.

146. Work was initiated jointly by GRID-Geneva and FAO Environment and Natural Resources Service on a new project relating to the use of GIS and Terra-moderate-resolution imaging spectroradiometer (MODIS) and Système pour l'observation de la Terre (SPOT) VEGETATION data for forest and wildfire detection, mapping and monitoring. The goal of the project is to achieve a better understanding of the human and physical conditions leading to the outbreak and presence of fires and to provide information about their impact on biodiversity.

147. FAO considers forest fire management an integral part of the conservation and sustainable management of forests, which is at the core of its forestry programme. FAO will summarize global data on forest fires through FRA 2000 and will continue to forge

partnerships and linkages with agencies involved in developing remote sensing techniques for detecting forest fires and wildfires, such as the Space Applications Institute of the EC Joint Research Centre.

148. In the context of the Advanced Real-Time Environmental Monitoring Information System (ARTEMIS), FAO has been cooperating closely with a number of European universities and private sector entities in the development and testing of ERS scatterometer data for drought monitoring in the Sahel and Ukraine, with support from the ESA Data User Programme. An operational follow-up activity, focusing on the entire African continent and five countries of the Commonwealth of Independent States, was concluded between the FAO Environment and Natural Resources Service and the Technical University of Vienna in November 2000 and will continue through 2001.

149. FAO cooperates with the regional commissions of the United Nations and regional and national remote sensing centres and environmental agencies in the development and efficient use of remote sensing and GIS technology for monitoring of natural disasters, focusing on capacity-building for the implementation of the recommendations of Agenda 21 and of the World Food Summit, as well as the international conventions on desertification, biodiversity and climate change, including the Kyoto Protocol.

150. The ITU Telecommunication Development Bureau (BDT) has developed a disaster communication handbook for developing countries, which will be published in early 2001.

151. In the framework of the UNESCO/IUGS GARS programme, the UNESCO Division of Earth Sciences will continue to carry out the final phase of the GARS-Asia project, which is intended to develop a new methodology for volcanic hazard assessment and prediction using multi-satellite data and GIS technology. Four volcanic test sites in the Philippines, Bulusan, Mayon, Pinatubo and Taal volcanoes, are being monitored in the project.

152. In late 1999, UNESCO started implementing a four-year project funded by the Government of the Netherlands aimed at strengthening the capacity of Central American countries to mitigate the effects of natural disasters. Activities include training and hands-on experience in geo-hazard zonation and vulnerability assessment and risk mapping using GIS technology. UNESCO cooperates closely with the Centre for Coordination of the Prevention of Natural Disasters in Central America (CEPREDENAC) and with ITC, Delft Technical University and the University of Utrecht, as well as with the GeoForschungsZentrum Potsdam of Germany and the Bureau de Recherches géologiques et minières of France. Preliminary discussions are taking place to launch similar initiatives in other regions, including Asia.

153. UNESCO continues to cooperate with the Council of Europe, EC and ESA in implementing the "Space Techniques for the Major Risks Management" (STRIM) programmes.

154. UNESCO cooperates with the European Association of Remote Sensing Laboratories and will jointly organize an international symposium on the theme "Observing our environment from space: new solutions for a new millennium", which will be held in Paris from 14 to 18 May 2001.

155. UNESCO cooperates with the Council of Europe, within the framework of the Council of Europe Open Partial Agreement on the Prevention of, Protection against and Organization of Relief in Major Natural and Technological Disasters, in carrying out research studies on the use of space technology in disaster management.

156. UNESCO will continue to support training courses on the applications of remote sensing and GIS to geological exploration and to the study of natural hazards of geological origin, to be held by the Aerospace Remote Sensing Development Group in Toulouse, France.

157. Major WMO global data-processing and forecasting centres operated by WMO members within the framework of the World Weather Watch and equipped with supercomputers and/or clusters of high-speed computing parallel processors depend critically on satellite-based observing systems. These form a major part of all observational monitoring, data analysis and processing to establish the state of the atmosphere and ocean environment, with a view to predicting and forecasting very short-range watches and warnings for severe weather events such as hurricanes and other tropical storms, tornadoes and severe thunderstorms, aviation hazards, marine hazards and long-range predictions of weather and climate extremes up to

seasonal and inter-annual time scales. WMO operates active programmes on tropical cyclone warning and forecasting with specialized meteorological centres and relevant national meteorological services covering most cyclone-active ocean basins. Likewise, WMO has implemented operational emergency response activities on the provision of transport model products for environmental emergency response activated in the event of nuclear emergencies, volcanic eruptions, forest fires, major chemical incidents or other relevant industrial incidents. These warnings and forecast products are made available by national meteorological and hydrological services to relevant state agencies, disaster managers at various national levels and the general public for disaster mitigation and management. The prediction skill of these products is equally critically dependent on the input of satellite remotely sensed observations into prediction models.

158. The WMO proposals for satellite-related events for the biennium 2001-2002 include two training workshops on hurricane forecasting and warning, to be held in Miami, Florida, United States, in 2001 and 2002, a training course on tropical cyclones to be held at the Regional Specialized Meteorological Centre on the island of Réunion (France) in 2001 and the Southern Hemisphere Training Course on Tropical Cyclones, to be held in Melbourne, Australia, in 2002, with emphasis on small island developing States and the southern hemisphere.

159. Additional satellite-based telecommunication systems have been installed in the South Pacific States, through the implementation of a European Union project and with support of the WMO Voluntary Cooperation Fund Programme, to upgrade the tropical cyclone warning capabilities in cooperation with Regional Association V (south-west Pacific).

160. With support from the WMO World Weather Watch, the WMO Commission for Aeronautical Meteorology, in collaboration with ICAO, is actively involved in the implementation of the World Area Forecast System (WAFS), which uses satellite-based communication systems to distribute information on aeronautical meteorological forecasts in support of commercial aviation (as part of the ICAO aeronautical fixed service). The London World Area Forecast Centre (WAFC) transmits WAFS products via the satellite distribution system for information related to air navigation to Africa, Europe and western Asia and the Washington WAFC transmits, using two satellites, to the rest of the world.

161. In cooperation with IMO and IOC, WMO maintains and continues to upgrade the internationally coordinated agreements, procedures, protocols and facilities, especially software, for the dissemination of meteorological and oceanographic data and information to ships at sea, and for the collection of data from those ships, using the IMSO maritime satellite system, in particular the Inmarsat-C facility. The WMO marine broadcast system, which is globally coordinated under the Global Maritime Distress and Safety System (GMDSS), became fully operational in 1999.

### 2. Enhancing economic, social and cultural security

162. In 2001, the Office for Outer Space Affairs will continue to provide technical assistance to UNDCP in using images from civilian satellites to monitor illicit crop cultivation. A methodology was developed in partnership with ESA to constitute part of the UNDCP Illicit Crops Monitoring Programme and was to be put at the disposal of interested Governments, as an element of a strategy to monitor the illicit cultivation of coca bush and opium poppy. In consultation with UNDCP, the Office convened an expert panel composed of six internationally recognized experts in the fields of remote sensing and global monitoring to review the technical aspects of the methodology included in the programme. The review will continue until the end of 2001. The work of the panel is expected to bring international transparency on the soundness and objectivity of the methodology and thus enhance the credibility of the results that would be obtained from the analysis of satellite images during the operational phase.

163. UNDCP began providing support in 1999 to member States to help them implement monitoring projects that would help countries in which there is illicit crop cultivation to improve their monitoring activities through the incorporation of geographic information technologies such as satellite imagery, GIS, GPS and integrated information systems. By 2003, projects will be implemented in Bolivia, Colombia and Peru in Latin America and Afghanistan, the Lao People's Democratic Republic and Myanmar in Asia.

164. FAO cooperates with UNDCP and other concerned agencies on projects to determine the location

of narcotic crop cultivation sites using satellite remote sensing data.

165. In 2001 and 2002, ECA will carry out a series of technical studies, including those listed below, which will deal with remote sensing and GIS:

(a) A technical compilation of success stories in the implementation of GIS for decision-making and a critical evaluation of the impact, costs and benefits of geo-information (October 2001);

(b) A study on the use of GIS in national statistical offices in selected African countries (October/November 2001).

166. ECA will continue to consolidate the contents of the database on geo-information in Africa, which includes GIS applications, mapping coverage and educational training facilities.

167. Following the first African Development Forum, ECA is developing three major proposals to enhance socio-economic conditions of the African population. These are:

(a) *Pan African electronic (e)-commerce initiative*. The e-commerce proposal looks at the range of tele-services and products and their markets with a view to identifying niche products and services for African small business. It analyses the policy environment needed to nurture e-commerce in the small business sector and examines the feasibility of a regional mechanism. The project promotes information-sharing and capacity-building in line with the recommendations of the first African Development Forum. In collaboration with the International Development Research Centre of Canada, ECA has developed a business plan aimed at putting in place desirable policy, regulatory, legal and other enabling conditions in selected African countries to stimulate private sector investment in e-commerce;

(b) *Health and ICT project*. The project identifies opportunities such as tele-medicine, national health record databases and use of ICT in health systems and their potential impact on the population and proposes a strategy and action plan. The strategy identifies actions at the national, subregional and regional levels and the entry points for South-South and North-South collaboration and proposes a phased implementation approach through pilot projects, surveys, evaluation, extension and ownership. It will target specific recommendations to Governments, the private sector, development agencies, non-governmental organizations and the diaspora;

(c) *SchoolNet Africa project*. The project supports the development of a regional framework—to be largely on-line—to build political awareness, secure resources, promote collaborative projects among students and teachers, to ensure that best practices are identified speedily and to promote the sharing of information and experience. The business plan being developed will identify a legal structure and concrete functions to be carried out by regional entities and supported under the project. The potential benefits of SchoolNet are enhanced learning opportunities for students, teachers and the community. Support to school networking organizations will strengthen the link between the various stakeholders and bridge the gap between policy and implementation to enhance knowledge-sharing and acquisition.

168. The ECE Transport Division will further develop the project on the automation and geographic application of the e road (international traffice artery) census. The project is composed of three parts, the development of the GIS database, which includes the input of road traffic census data from ECE member countries; the hard-copy publication of the statistical report and maps; and the electronic publication on CD-ROM of the census results. ECE is also planning to prepare an Internet application of the project.

169. Through GRID-Geneva, UNEP maintains up-to-date databases of human population density and distribution for Asia and the Russian Federation. The data sets were developed using GIS modelling techniques and the most recently available data on sub-national administrative boundaries and human population at the third (district) administrative level. The GIS model is based on an "accessibility index" and the tendency of people to cluster near existing centres of population and along the transportation infrastructure. The final gridded GIS data sets can be used for a wide variety of applications, including assessment of human impacts on the environment, agriculture and poverty mapping. The report and results of the project are available on the Web (http://www.grid.unep.ch). UNEP will also continue its efforts to complete comprehensive and globally consistent data sets relating to global land cover, digital elevation, drainage basins, population and forest

vegetation in cooperation with agencies around the world.

170. Through EAP.AP-Bangkok and with financial assistance from the Asian Development Bank, UNEP prepared a 1:1,000,000-scale database of the entire greater Mekong subregion and a 1:250,000-scale database for the five selected hot spot areas in the same subregion, which is being used to prepare the strategic environmental framework for the greater Mekong subregion. These databases consist of both biophysical and socio-economic information. EAP.AP-Bangkok is developing a GIS-based early warning system for the greater Mekong subregion from the environmental perspective, which is suitable for use in transportation and hydropower planning.

171. Also through EAP.AP-Bangkok, UNEP is cooperating with the branch office of UNHCR in Nepal to develop a database pertaining to environmental assessment and contingency planning for the areas around the refugee camps in eastern Nepal.

172. UNEP will continue to explore actively means of cooperation with UNDP on ways to extend the results of the integrated socio-economic and environmental database developed for Rwanda by UNEP and Michigan State University in the United States to databases covering other countries and subregions.

173. The FAO Environment and Natural Resources Service in cooperation with GRID-Arendal and the Consulting Group on International Agricultural Research Consortium for Spatial Information represented by the International Centre for Tropical Agriculture (CIAT), started a poverty and food insecurity mapping project on 1 September 2000. This is a three-year project funded by the Government of Norway. Its main objectives are to apply GIS technologies for improving understanding and mapping of poverty and food insecurity, to make those maps more widely available through an interactive, Web-based thematic atlas and to develop a network for gathering and disseminating the best science on the subject.

174. In November 1999, the FAO Conference approved a long-term strategic framework for 2000-2015. Among five corporate strategies proposed for the strategic framework, one clearly emphasizes improving data availability and information exchange; monitoring, assessing and analysing the global state of food and nutrition, agriculture, fisheries and forestry; and promoting a central place for food security in the international agenda. A priority of the strategy is that a comprehensive, current and reliable set of data should be disseminated to all members and made accessible to the international community and the public at large.

175. FAO implements a number of GIS analysis and applications projects, including (a) potential food self-sufficiency at high- and low-input levels; (b) a nutrition profile map; (c) fish distribution maps for the Mediterranean; and (d) World Food Summit support maps. Remote sensing and GIS technology are also being used for food insecurity, vulnerability and poverty mapping by FAO in cooperation with several other agencies including GRID-Arendal and the International Centre for Tropical Agriculture.

176. FAO, through ARTEMIS, will continue to support the operational monitoring of seasonal growing conditions and vegetation development on a global basis, based on hourly Meteosat data and daily data from the SPOT-4 VEGETATION programme and NOAA-AVHRR, for use in early warning for food security and desert locust control. This includes routine distribution of ARTEMIS images, containing information about rainfall and vegetation biomass activity, by electronic means to users at FAO headquarters and at the regional and national levels. FAO, in cooperation with the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) and EC, continues to support the establishment and improvement of local reception and processing systems using low-resolution environmental satellites, primarily in Africa and including the development of improved interpretation techniques and user-friendly analysis software. In order to expand the capabilities of ARTEMIS to a global coverage, FAO, in cooperation with EC through the Space Applications Institute of its Joint Research Centre and SPOT Image, has imple-mented a fully automated routine flow of global 1 km-resolution VEGETATION data from the SPOT-4 satellite. This arrangement will be continued until 2003 under an FAO/EC agreement on support from the European Union to the FAO Global Information and Early Warning System on Food and Agriculture (GIEWS). In December 1999, following the successful launch of the first Terra satellite by NASA, FAO signed a formal agreement with NASA on the development of the operational use of Earth observation data from the MODIS instrument on Terra satellites in a variety of application fields within the FAO mandate. The

Terra-MODIS dataflow to ARTEMIS foreseen under this agreement will be activated early in 2001. Similar discussions are taking place with EUMETSAT and ESA concerning the future Meteosat second-generation and Envisat satellite missions, respectively. FAO participates actively in the current European Union/EUMETSAT discussions on the upgrading of Meteosat primary data user station facilities on the African continent for Meteosat second-generation reception. Detailed information about the ARTEMIS system and its databases and software facilities can be found at http://metart.fao.org

177. Through the use of remote sensing and GIS technology, FAO is contributing to the development of schemes to control transboundary livestock diseases under the FAO Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases (EMPRES) programme. Earlier studies relating to normalized difference vegetation index (NDVI) data sets from ARTEMIS to tsetse distribution and land utilization types in Nigeria and Togo led to the establishment of an operational information system to define policies for African animal trypanosomiasis control, under a regional project in Burkina Faso and Togo, supported by the Government of Belgium. Remote sensing is used to define technical concepts for tsetse control in countries where high-resolution satellite imagery is available to discern land utilization types. A project is currently being prepared to design maps and GIS to assist 11 western African countries affected by onchocerciasis. These programmes will benefit substantially in future years from the SPOT-4 VEGETATION and Terra-MODIS data available through ARTEMIS. GIS also plays a central role in the establishment of a "global livestock geography", comprising the production of 10 km-resolution maps showing the distribution, over time, of the different livestock species worldwide.

178. FAO, through its Plant Protection Service, in cooperation with the Environment and Natural Resources Service and with support from the Government of Belgium, has developed and implemented the Reconnaissance and Management System of the Environment of Schistocerca (RAMSES) within the framework of its EMPRES programme. The objective of RAMSES is to improve the use of Meteosat and SPOT-4 VEGETATION data for the early detection of locust breeding areas in Africa in association with locally collected, georeferenced field data and a database containing historical data on desert locusts and covering the period from the late 1920s to the present, which resides at FAO in a dedicated GIS called "SWARMS". During 1999, increasing use has been made of the SPOT-4 VEGETATION data, which have distinct advantages over the NOAA-AVHRR data in terms of locational accuracy and area coverage. A regular flow of SPOT-4-based vegetation index products to Algeria, the Libyan Arab Jamahiriya, Mauritania, Morocco and Tunisia through electronic communication to support desert locust surveys at the regional and national levels was started in October 2000. During 2001, the spectrally and spatially superior MODIS data are likely to improve further detection and monitoring capacity for locust control.

179. FAO has started to collaborate in a pilot project in Mali that aims to define a national operational information system for both food security and desertification control.

180. With support from UNDP, FAO has developed a programme management information system (ProMIS) for Afghanistan with the objective of supporting the assistance efforts of organizations of the United Nations system, donors to non-governmental organizations and Afghan institutions in coordination, planning and implementation and enhanced monitoring and evaluation of humanitarian, emergency and development efforts. The primary objectives of ProMIS are (a) to make data and documents broadly accessible and easily usable; (b) to provide tools for translating geographical and spreadsheet data into information products; (c) to assist organizations in capitalizing on investment in data and information; (d) to support the implementation of current and new management systems; and (e) to facilitate monitoring and evaluation of new Afghan assistance programmes. ProMIS development, which was started in 1997, is currently continuing and has been extended to approved projects in Jordan, Lebanon and the Libyan Arab Jamahiriya.

181. FAO regularly produces, in cooperation with national remote sensing institutions, the Remote Sensing for Decision-Making series in various languages for worldwide distribution.

182. FAO is involved in helping member countries strengthen their capacity to develop distance learning programmes using various means, including satellite communications systems. Through its Extension, Education and Communication Service, FAO provides

technical advice to member countries in establishing distance education centres and developing course programmes. The activities target specific interested groups such as farmers, farm workers and managers, extension workers, teachers, other government agriculture and rural development workers, agriculturally related clientele of non-governmental organizations and the private sector. Such activities have benefited member countries such as China, through a project on the Agriculture and Rural Television Broadcast Education Centre, and Zimbabwe, through the Zimbabwe Open University project.

183. Increasingly involved in information and communications technology applications, FAO is progressively moving to the digital age by developing the World Agricultural Information Centre (WAICENT) and various corporate digital spatial databases, including various environmental decision-support tools. Through worldwide networking, FAO aims to expand the reach of its services to help member States to design and implement national and regional policies and strategies for using new and emerging space technology and applications for sustainable agricultural development. A digital FAO will doubtless improve the accessibility of data and information for decision-making and create awareness among various end-users and cooperation with international organizations, Governments and the various stakeholders on a wide range of sustainability issues. Since September 2000, the Environment and Natural Resources Service has been cooperating with ESRI on the development of a spatial information networking concept aiming at improving the access to and exchange of geographical and thematic databases using Internet capabilities. Comprehensive information about FAO policies and strategies as well as technical programmes and activities of the Organization can be accessed at the FAO Web site (http://www.fao.org). FAO activities, information and publications relating to space applications, including remote sensing, GIS, agro-meteorology, the environment, education and communications, can be found on the Web site of the FAO Sustainable Development Department, SD-Dimensions (http://www.fao.org/sd).

184. The main FAO activities involving agro-climatic data-bases and agro-meteorology, using data from both satellite and in situ observations, and using GIS tools, include (a) management of a climatic database for about 25,000 stations worldwide, FAOCLIM; (b) production of digital maps (at various levels) based on the climatic database; (c) compilation of a database of African sub-national crop statistics; (d) real-time monitoring of food crop conditions and yield forecasting, in particular for African countries; and (e) fulfilment of specific requests that require the analysis of climatic data integrated with socio-economic variables. ARTEMIS and the agro-meteorology programme AGROMET are providing essential value-added analysis and related information products for the FAO operational GIEWS on food and agriculture. Since September 1999, ARTEMIS and agro-meteorological climatological data-bases have been accessible through a common Web site (http://metart.fao.org).

185. UNESCO and UNDP are implementing the sustainable development of the South Valley and Sinai programme using remote sensing and GIS technologies, in cooperation with the Geological Survey of Egypt and the Egyptian National Authority for Remote Sensing.

186. The UNESCO World Heritage Centre is also developing with ESA a modern information management system for the monitoring of cultural and historical sites.

187. Within the framework of its space archaeology programme, UNESCO will cooperate with the Italian National Research Centre on New Technologies, Energy and Environment in organizing an international conference on architecture, volcanism and remote sensing, to be held in Italy in May 2001. An international symposium on space archaeology in connection with archaeological excavation in Egypt, which addresses the role of remote sensing in the excavation of ancient Egyptian tombs in Dahshur, is also planned for 2001.

188. UNESCO will continue to examine different ways and means of wider usage of low- and geo-stationary orbit satellite systems for communication, information, informatics, education, science, culture and environmental protection in its programmes, such as the International Commission on Education for the Twenty-first Century. As part of the programme, UNESCO assesses, evaluates and studies the experience achieved in distance education as well as the impact of new communication and information technologies, in particular communication satellites useful for distance education.

189. UNESCO participates in the Trans-European Tele-education Network initiated by EC aimed at creating a European distance training network. UNESCO cooperates with the Czech Republic, Hungary, Lithuania and Poland.

190. UNESCO participates in an ESA telemedicine project in Palestine aimed at strengthening Palestine's distance learning capabilities with respect to medical education.

191. UNESCO is assisting the International Organization for Statistical Studies on Oesophagus Diseases in developing telemedicine projects on information validation and exchange and distance learning.

192. UNESCO and ITU initiate pilot projects on education applications of interactive television, two of which will soon be carried out in Cape Verde and India. The projects, which support teaching of primary teachers in developing countries, consist of providing sound and visual images to "virtual classrooms". The return path enables the viewer to communicate by voice and data channels with the broadcast site. While UNESCO is responsible for the conceptual aspects and educational content, ITU, which is developing the standards, takes primary responsibility for the technical implementation and choice of technological solutions.

193. The UNESCO Division for Science Policy Analysis and Operations and the Arab Gulf Programme for United Nations Development Organizations in 2000 initiated a distance education for blind people project, which aims at creating a cyber multimedia space education for blind people through new information technologies. Some of the components of the project include the introduction of Arabic Braille computer technology and pedagogical methods based on the use of computerized methods in basic education of blind children. The virtual classroom concept for blind people will be implemented in centres in Qatar and Saudi Arabia. The creation of an Arab Satellite University, initiated by the Division in 1998, is achieving considerable progress through Nilesat (Egyptian television channel) for open distance learning.

194. UNESCO is carrying out a distance education network information project that aims at assisting the Libyan Arab Jamahiriya in developing a national strategy and a long-term plan for the introduction of communication and information technologies in higher education and scientific research. The project will result in the establishment of a network for distance education linking all institutions of higher learning in the country.

195. UNESCO is providing technical expertise for the design and technical preparation of the project document on educational and technological aspects of the Arab Open University in cooperation with the Open University of the United Kingdom. The project supports the development strategy of an Arab Open University and a long-term plan for the introduction of new technologies in higher distance education in all branches.

196. A working group of the WMO Commission for Agricultural Meteorology is currently responsible for reviewing and summarizing the development of techniques and methods to obtain and manage ground-based and remotely sensed agro-meteorological and agronomic data in the most timely and efficient manner for applications to agriculture.

## C. Utilizing and facilitating information and communications technology for development

197. The Office for Outer Space Affairs, within the framework of the United Nations Programme on Space Applications, will continue to support the work of the Asia-Pacific Satellite Communications Council, which was established in 1994 with the assistance of the Programme and has now expanded to 86 members from 28 countries. The Council has been playing a key role in promoting development of and cooperation in satellite communications in the region by providing a platform to exchange views and ideas on new technologies, systems, policies and satellite communication services. It organizes the Asia-Pacific Satellite Communication Conference and Exhibition for Global Communication on a biennial basis. The next Conference will be held in 2002.

198. The Office for Outer Space Affairs will continue to provide information on its activities through its Web site (www.oosa.unvienna.org) and has developed a Web site dedicated to coordination of space activities in the United Nations system (www.uncosa.unvienna.org).

199. UNEP, through GRID-Sioux Falls, will continue to disseminate information related to the latest developments in information technology, including remote sensing, GIS data management and applications and Internet technologies. Through GRID-Sioux Falls, UNEP is also pioneering the use of interactive IMS technology within the United Nations system that would allow users to specify data and the scale of maps in cooperation with ESRI. In this connection, UNEP, through GRID-Sioux Falls, has completed the global energy and water cycle project with advanced Internet data access capability and has implemented a clearinghouse node for UNEP data that is compliant with the standards of the ISO/Federal Geographic Data Committee of the United States Geological Survey.

200. In 2001 and 2002, UNEP will strive to make more of its published and database materials available on the Internet and the World Wide Web. Over one million freely available files have been transferred over the past years from the award-winning Internet site of GRID-Sioux Falls. UNEP will continue to promote such access to important data and information.

201. The space-based telecommunications of UNEP.net and Mercure are providing invaluable support to and enhancing the cost-effectiveness of the operations of UNEP as a United Nations entity. One area in which this is evident is videoconferencing. UNEP.net/Mercure now supports digital telephone services of the integrated services digital network for all United Nations agencies located at the Gigiri campus in Nairobi. As a result, videoconference services from the desktop are now feasible. These services not only reduce the need for missions but also facilitate regular brief interactions, such as participation by the Executive Director in weekly high-level management sessions with his peers. Similar videoconference services are now being implemented at some UNEP regional and outposted offices on six continents. UNEP.net/Mercure satellite services also provide a number of services that reduce the telecommunications costs of UNEP. Particular areas of interest are Internet-based services for telephony and fax. Similar services are also being extended to UNEP regional and outposted offices on six continents. UNEP.net/Mercure is participating in the work of CEOS. UNEP serves as the user vice-chair of the Working Group on Information Systems and Services of CEOS. IOC also cooperates closely with CEOS in the activities of the Working Group.

202. ECA has, in partnership with African and international organizations, Governments, civil society and public and private sector stakeholders, started progressively integrating new information and communication technologies to strengthen its core roles as a forum of choice and a hub of policy networks and advocacy on issues of vital social and economic importance to Africa. In that regard, ECA will apply information and communication technologies to transform itself into a knowledge-based organization that enriches—and is enriched by—the intellectual and information resources that underpin development in all countries in the region. To realize its mission, ECA will enhance its capacity to galvanize Governments and people in the region by using information and communication technology to promote discourse prior to, during and following key meetings. In this connection, ECA will: (a) package the content of key conferences and meetings in digital form for transmission over a broad range of media; (b) supplement conferences by providing on-site training in the use of the technologies to access information and engage in debate; (c) facilitate access to training in areas where its programme reveals gaps and needs; and (d) support bridge-building between African institutions and the international development community.

203. ECA launched the Information Technology Centre for Africa (ITCA) project on the occasion of the first meeting of the African Development Forum, held in October 1999 in Addis Ababa. ITCA aims to raise awareness among African policy and decision makers of the importance of building the information society in Africa and providing focused training on new information technologies for both policy-makers and policy implementers. In 2001, ITCA will start its first training course in networking technology for African women, in collaboration with the Cisco Networking Academy Program and the World Bank Information for Development Program (*Info*Dev). Furthermore, ITCA has already started organizing exhibitions related to the themes of major conferences and meetings at ECA and will soon serve as a year-round exhibition centre, which will focus on demonstration of the general use of information and communication technologies and sector applications.

204. ECA will organize the second meeting of the Committee on Development Information, including its plenary and its subcommittees on information and communication technologies, statistics and geo-

information (Addis Ababa, 2-5 April 2001). The Committee reports to the ECA Conference of Ministers responsible for economic development and planning.

205. In 2001 and 2002, ECA will continue to provide advisory services to its member States and subregional and regional institutions on the development of information and communications infrastructure, policies, plans and strategies.

206. With its growing involvement in the area of telecommunications, including the regulatory framework, ECLAC visualizes further involvement and support in the near future regarding international law and standards for the peaceful use of outer space in the field of telecommunications.

207. Within the framework of the minimum common programme of RESAP II, ESCAP will develop and implement in future years, when resources become available, regional cooperative projects on the applications of satellite communication for sustainable development at the national and regional levels, including projects on the following issues:

(a) Integrated rural capacity-building through satellite-based data and information exchange infrastructure;

(b) Development of multi-media materials for interactive tele-education;

(c) Tele-medicine for rural populations.

208. The ESCAP Regional Working Group on Space Science and Technology Applications, at its annual meeting in 2000, decided to undertake in subsequent years the following new common denominator projects under RESAP II:

(a) Preliminary investigation of the feasibility of developing classroom resources utilizing regional small satellites and the low-cost receiving station developed by Nanyang Technology University;

(b) Low-cost infrastructure of high-speed Internet access for rural areas.

209. ESCAP will facilitate under the Dialogue Forum the development and implementation of regional cooperative projects among member countries on the cooperative distance education system. In 2001, ESCAP will conduct a study on a policy framework for operational integration of satellite-based remote sensing, communication, meteorology and positioning services for sustainable development into the "information superhighway", and will initiate in 2002 a study on frameworks of association for regional space industries to support sustainable development. ESCAP will also contribute to research and demonstration activities on the use and potential of high data rate communication satellites in community-based teleservice centres.

210. ESCAP will hold the annual meeting of the Regional Working Group on Satellite Communication Applications in Bangkok in March 2001. The venue of the annual meeting in 2002 is to be determined.

211. In the light of technological development, ITU radiocommunication study groups 1, 3, 4, 6, 7 and 8 will pursue studies on technology and spectrum/orbit utilization for space communications. The radiocommunication study groups are part of the ITU Radiocommunication Sector (ITU-R), which is responsible for studying technical, operational and regulatory/procedural questions on radiocommunication, issuing recommendations and preparing the technical basis for radiocommunication assemblies and world radiocommunication conferences. In particular, ITU-R has established standards for the detailed specifications of the radio interfaces of International Mobile Telecommunication-2000 (IMT-2000), the satellite component of which is comprised of six different interfaces.

212. BDT has been studying technical, operational and tariff questions and adopting recommendations on them with a view to standardizing telecommunications on a worldwide basis. The priority for the Bureau is the elaboration of standards for the implementation of the Global Information Infrastructure and global multimedia mobility. The Bureau will continue its studies in the application of space technology in different services, such as aeronautical, maritime and land mobile telecommunication services to remote regions and for weather forecasts. The Bureau will also continue to ensure the full integration of the satellite transmission medium in worldwide telecommunications networks.

213. The intersectoral groups of ITU-R and BDT ensure that studies carried out in the two sectors are conducted in a harmonized way, avoiding any possible overlapping and dispersion of efforts. The intersectoral group on satellite matters reviews the recommendations of the two sectors in order to ensure the full integration of the satellite transmission medium in the

telecommunication networks, taking into account emerging technology, applications and services.

214. BDT is now implementing the Valletta Action Plan adopted by the Second World Telecommunication Development Conference in May 1998. The Valletta Action Plan includes the following chapters: chapter I on the programme of cooperation among the members in the telecommunication development sector; chapter II on the Valletta Action Plan programmes; and chapter III on the special programme for least developed countries (see A/AC.105/726, para. 174 (d)).

215. ITU will organize the World Telecommunication Policy Forum to discuss and exchange views and information on broad telecommunication policy issues, technological advances, infrastructure development and financial business considerations. The Third World Telecommunication Policy Forum, which will be held in Geneva from 7 to 9 March 2001, will consider issues relating to Internet protocol telephony.

216. ITU organizes on a quadrennial basis the World Telecommunication Exhibition and Forum (TELECOM) in Geneva, as well as similar four-year rotational regional events in the Americas, Asia and Africa. The next World TELECOM will take place in Geneva in the year 2003. Problems related to the ever-increasing uses of outer space, such as communication satellites, remote sensing and navigational services, as well as direct satellite broadcasting to rural and underdeveloped areas of the world, are some of the main issues of concern and discussion at these forums.

217. ITU conducts World Radiocommunication Conferences every two to three years. The purpose of these conferences is to update the international radio regulatory process and prepare for future requirements. The World Radio Conference 2000, held in Istanbul, Turkey, from 8 May to 2 June 2000 established a number of new arrangements for technical and regulatory aspects of communication using geostationary and non-geostationary satellites for various services, such as mobile satellites, Earth-exploration satellites, space research satellites, meteorological satellites and broadcasting satellites. The Conference also adopted a new plan for broadcasting satellite services for countries in regions 1 and 3. The plan increases the channel capacity for countries in those regions and follows intensive studies undertaken through an inter-conference representative group during the three years preceding the Conference. The next world radiocommunication conference is scheduled for 2003 and has an extensive agenda, including a number of issues relating to space services.

218. The Conference Preparatory Meeting, which has been established to carry out the necessary preparatory work for world radiocommunication conferences, will continue its work. The ITU-R study groups are conducting studies in the field of space radiocommunications concerning technical aspects of mobile-satellite, fixed-satellite, Earth-exploration-satellite, meteorological-satellite, space-research, space-operation and broadcasting-atellite services and low-Earth-orbit satellite systems. The Conference Preparatory Meeting will prepare a report to the World Radiocommunication Conference 2003 to assist the ITU members who will be involved in the deliberations of the 2003 Conference. During the first meeting of the Conference Preparatory Meeting immediately following the 2000 Conference, the members of the study groups, working parties, task groups, joint rapporteur groups and joint task groups of the Radiocommunication Sector were entrusted with the responsibility of preparing the studies requested by the 2000 Conference ahead of the 2003 Conference.

219. Following the 1994 call by the ITU Plenipotentiary Conference, in its resolution 18, for a new in-depth review of the ITU spectrum/orbit resource allocation, the World Radiocommunication Conference 1997 decided to implement a number of measures to increase efficiency and equity in spectrum/orbit utilization. The practical implementation of these measures was considered by the World Radiocommunication Conference 2000 and will be reviewed again by the World Radiocommunication Conference 2003.

220. With a view to providing technical assistance to the participating countries, the ITU Radiocommunication Bureau (ITU-BR) organizes world seminars every two years and regional seminars in the intervening years on frequency management, the use of the geostationary orbit and preparatory activities for the radiocommunication conferences

221. BDT conducts, within the Valletta Action Plan for global telecommunications development, round tables and seminars on telecommunication policies, strategies, research and development for developing countries, training of staff from developing countries in various areas of telecommunications, use of the Global

Maritime Distress and Safety System and mobile satellite communications, in particular global personal communications by satellite (GMPCS). The Bureau also promotes applications of new technologies for the development of telecommunications services in developing countries, especially for rural and isolated areas, through the implementation of pilot projects.

222. ITU has four projects for the establishment of centres of excellence in telecommunications: two in Africa, one in Asia and one in the Americas. The centres will play an important role in strengthening competencies in the field of telecommunications by the different levels of management in the areas of policies, regulatory activities, management (frequency management) and technology.

223. At the request of administrations of member States that are developing countries, BDT will continue to provide experts to participate in satellite Earth station projects and in the planning of regional or domestic satellite communication systems. Documents prepared by the Bureau, such as the telecommunication development plans, master plans or sectoral studies, usually include a satellite component.

224. Administrations of member States will continue to be kept informed on a regular basis, through the fortnightly information circulars of the Radiocommunication Bureau and the special sections annexed thereto, now published on CD-ROM, of the basic technical characteristics, frequency assignments and orbital positions of space systems communicated to the Bureau. This information is also made available on the Internet.

225. ITU-BR periodically publishes approved recommendations, either new or revised, on space radiocommunications. Publications of special interest for space radiocommunications concern issues on space applications; fixed-satellite, mobile-satellite, radio-determination-satellite, amateur-satellite and broadcasting-satellite (sound and television) services; satellite news gathering; frequency sharing; and compatibility of different services. They form the basis for harmonious technical development of space radiocommunication systems and contain criteria for the sharing of frequency bands between the various space services, as well as between space and terrestrial systems.

226. On a quarterly basis, ITU-BR publishes an updated list, known as the Space Network List, of orbital positions and associated frequency bands of space stations on board geostationary satellites and non-geostationary space systems. The Space Network List is now also available online. In more detailed form, the Bureau publishes, on CD-ROM, all the technical characteristics of satellite networks submitted to it under the coordination or notification procedures, for recording in the Master International Frequency Register. The information is also available on the Internet.

227. BDT published in 2000, in collaboration with the GMPCS operators and industry, a reference book compiling basic technical, operational, regulatory and socio-economic information related to the introduction of GMPCS technology and services in the world in general and in developing countries in particular. This work is part of the Bureau's assistance to the developing countries in apprehending and optimizing the use of and benefits from GMPCS, which is the latest space telecommunication application technology.

228. Information and communication technologies for development represent a major programme area of UNESCO and will be a priority theme for the biennium 2002-2003. In the information and informatics area, promoted through the UNESCO intergovernmental "Information for All" programme, satellite links will continue to be stressed where they are feasible and cost-effective for developing country institutions, for example, to support activities in areas such as national public service telematics networks, distance education, virtual laboratories, digital libraries and community multimedia centres.

229. In the wake of the Global Knowledge Partnership Action Summit, held in Kuala Lumpur in March 2000, UNESCO launched a new programme for community multimedia centres, jointly implemented with ITU, and has taken up the "champion" role for item 1.3 of the Action Plan formulated by the Summit, on the integration of new and traditional technologies for community development. Within this context, new initiatives have been taken involving the use of space technology.

230. The WorldSpace Foundation has given UNESCO the opportunity to use its multimedia channel, the Africa Learning Channel free of charge to deliver contents (education, science and culture) anywhere in

Africa, with or without connectivity, by downloading via the WorldSpace receiver.

231. Within the framework of implementation of a project in Niger in which UNESCO is participating, Afristar audio channels (WorldSpace satellite) are used to provide radio stations in isolated rural communities with access to information. The network will expand to 150 villages and will integrate information centre facilities, including multimedia facilities, with the radio stations.

232. UNESCO will continue to promote, through its microbial resources centres (MIRCENs), activities in bioinformatics, such as the Biotechnology Information Exchange System in Slovenia, the World Data Centre MIRCEN in Japan and a series of electronic conferences conducted by the MIRCEN in Sweden. UNESCO, through its MIRCENs, will also support research workshops and training in gene sequencing and gene database development for use directed towards environmental management and human welfare in space capsules and life-sustaining systems in orbit.

## D. Using and improving satellite positioning and location capabilities

233. In 2001 and 2002, the United Nations Programme on Space Applications will organize four regional workshops on the use of global navigation satellite systems (GNSS), with funding provided by the Government of the United States. Findings and recommendations will be reviewed for follow-up action by a group of experts, including policy makers, manufacturers, service providers and users, as well as representatives of relevant international and regional organizations, at an international meeting to be held in 2002.

234. ICAO is developing provisions for ground- and satellite-based augmentation systems for GPS/GLONASS to improve their overall availability, integrity and accuracy for aeronautical applications. Future work will include the development of ICAO standards for GNSS enhancements such as GPS L5, an additional civil frequency for GPS, and standards for aeronautical applications of Galileo.

235. ICAO and ITU are continuing cooperation for the allocation of spectrum and its protection for the aeronautical applications of satellite-based communication, navigation and surveillance systems. At the World Radiocommunications Conference 2000, spectrum was allocated for Galileo that includes aeronautical applications and the GPS L5 band.

236. ICAO and IMO are continuing coordination and exchange of information on various aspects of GNSS development and implementation. ICAO contributed to the formulation of a maritime policy on GNSS, which was approved by the IMO Assembly. Both organizations continue to exercise a coordinated approach in supporting the evolution of GNSS towards a future system capable of supporting advanced applications for aeronautical and maritime navigation.

237. ICAO, recognizing the limitations of the present air navigation systems and the need to meet future requirements, has taken steps to promote the introduction of, inter alia, satellite-based technologies for communication, navigation and surveillance (CNS) elements in support of global air traffic management (ATM). The systems are an integration of terrestrial and space elements that will fulfil future international civil aviation requirements well into the present century. A fundamental prerequisite for the implementation of the systems on a global basis includes the development of uniform standards and recommended practices (SARPs). Several panels of experts are involved in these activities under the responsibility of the ICAO Air Navigation Commission. With respect to space-related elements of the CNS/ATM systems, SARPs and guidance material have been completed for the aeronautical mobile-satellite service. Furthermore, acceptability criteria for aeronautical safety-related applications have been developed concerning the use of next generation satellite systems (NGSS), which utilize medium-Earth orbits and low-Earth orbits for the provision of mobile communications. The NGSS implementation has suffered a setback recently owing to the failure of the Iridium company. SARPs for other elements, including NGSS, have been developed. SARPs for air traffic service applications, including automatic dependent surveillance (ADS) systems and procedures, which are largely supported by satellite communications, are under development. Additional ADS provisions will be available in 2001. Provisions for the emergency locator transmitter, based on the International Search and Rescue Satellite System (COSPAS-SARSAT) programme have been reviewed, and amended SARPs have been completed. The

planning and implementation of the CNS/ATM systems of ICAO are facilitated by a global plan and the activities of regional planning and implementation groups.

238. ICAO is conducting activities to face new challenges concerning human resources involved in the introduction of advanced satellite-based CNS/ATM. ICAO addresses human resource planning and training issues through its TRAINAIR programme, which provides a mechanism for cooperation among training centres for the development of the many new training courses that are required to support the introduction of CNS/ATM. Following the seminars organized in 1999 on the implementation of GNSS for the Asian and Pacific, Caribbean and South American regions, ICAO will continue to organize similar seminars in the future.

239. The ICAO Assembly at its thirty-second session, in 1998, adopted the Charter on the Rights and Obligations of States relating to GNSS Services (resolution A32-19), which embodies fundamental principles applicable to GNSS. An ICAO secretariat study group was established to consider, inter alia, the creation of an appropriate long-term legal framework to govern the operation of GNSS.

## E. Building capacity for space applications for sustainable development

240. The Office for Outer Space Affairs will continue to provide technical advice to the Government of Uruguay in its follow-up, as pro tempore secretariat, of the recommendations of the Third Space Conference of the Americas, held in Punta del Este, Uruguay, in November 1996, and in preparation for a possible Fourth Space Conference of the Americas.

241. Within the framework of the United Nations Programme on Space Applications, the Office for Outer Space Affairs will organize workshops and symposia in 2001 and 2002 on data analysis, participation of youth in space activities, small satellites and other applications or policy-related themes. The Office will also organize workshops and training courses to build the capacity of developing countries and countries with economies in transition in the fields of remote sensing and its applications. A list of those activities is contained in annex I to the present report.

242. In 2001 and 2002, the United Nations Programme on Space Applications will continue to provide technical support to the regional centres for space science and technology education affiliated with the United Nations, in particular in organizing their educational and training activities. The regional centre in Asia and the Pacific, which was inaugurated in India in 1995, offers postgraduate-level courses in the fields of: remote sensing and GIS; satellite communications; satellite meteorology and global climate; and space and atmospheric sciences. The two regional centres in Africa, one for the education and training in the French language in Morocco and one for the English language in Nigeria, were inaugurated in April 1998, and began their education and training programmes in 1999. The inauguration of the regional centre in Latin America and the Caribbean, hosted by Brazil and Mexico, is expected to take place in 2001, in Brazil and Mexico. The inauguration of the centre in western Asia to be established in Jordan is also expected to take place in 2001. The Programme will continue to provide technical assistance to the Network of Space Science and Technology Education and Research Institutions of Central-eastern and South-eastern Europe.

243. In 2001 and 2002, the Office for Outer Space Affairs, through the United Nations Programme on Space Applications, will provide assistance to the regional centres for space science and technology education and the Network by further promoting awareness of the importance of their capacity-building efforts. The Office will submit a report to the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space at its thirty-eighth session, in 2001, on their achievements to date and their current activities (A/AC.105/749). The Office will also bring the accomplishments of the centres and Network to the awareness of the organizations of the United Nations system in order to promote their participation in the activities of the Centre and the possible establishment of partnerships among the centres, Network and the organizations. In cooperation with ESA, the Programme will organize a meeting of experts in 2001 to review and update the standard educational curriculum that the Programme provided to the centres in 1996 as a guide for their education programmes.

244. The UNEP Division of Early Warning and Assessment has been further restructured along functional lines to include an Assessment and Reporting

Branch, an Observation and Networking Branch and a Decision-Support Systems Branch. The Networking Branch encompasses the GRID and the Global Environmental Information Exchange Network (INFOTERRA) networks, data and information management in support of assessment and regional capacity-building activities (ENRIN programme) at the institutional level, whereas the Decision-Support Systems Branch deals with production of appropriate outputs and the dissemination and exchange of scientific and technical environmental information.

245. UNEP capacity-building activities are restricted to those institutions that are active in expanding their data and information assessment network serviced by GRID and ENRIN. UNEP network capacity-building and servicing activities are aimed, as appropriate, at identifying the needs of partner institutions, designing projects and formulating proposals to meet those needs and assisting the institutions in mobilizing resources to implement the projects. In return, UNEP seeks to enter into agreements on data access and exchange in the service of international assessment and reporting.

246. In Africa, UNEP continues to build networks and serve as a catalytic force for capacity-building with the support of GRID-Nairobi. A dialogue is ongoing with the Intergovernmental Authority on Development (IGAD) on a network strategy for the IGAD countries.

247. UNEP maintains cooperation with SADC in the development of networks to support environmental and land management in the region. A joint SADC/UNEP initiative is aimed at strengthening national and subregional institutional capacities for environmental data and information management to support decision-making processes. The initiative comprises the following two components: SADC Regional Database Development and Networking, implemented by the SADC Food Security Technical and Administration Unit for the SADC Environment and Land Management Sector, and Environmental Information Services (EIS) training and education, providing SADC and member States with necessary support to establish and strengthen in-country EIS training and education infrastructure to meet the growing demand for skills in the specialized areas of environmental assessment and reporting, as well as environmental data and information management

248. UNEP is working on a similar initiative for the subregional organization of the Permanent Interstate Committee for Drought Control in the Sahel. In collaboration with AGRHYMET, UNEP drew up a regional EIS and networking implementation strategy, focusing on the following four strategic areas: institutional capacities; information exchange networks; harmonization and standardization of data and assessment and monitoring tools, including those for national and regional reporting on the state of the environment; and in-country training capacities. UNEP and its EIS-Africa cooperate with countries in west Africa to develop guidelines for data standards and harmonization to facilitate the exchange and use of information within the region.

249. EAP.AP-Bangkok will provide funding in the year 2001 for one person to study for a master's degree at the Asian Institute of Technology in Thailand and will conduct two internships for the countries participating in a land cover project in 2001.

250. UNEP continues to develop data access agreements in Asia and the Pacific with cooperating institutions in the Association of South-East Asian Nations (ASEAN), the Mekong River Commission, ICIMOD, the South Asia Cooperative Environment Programme, at Colombo, and the South Pacific Regional Environment Programme, as well as other small intergovernmental organizations. Regular meetings are held with the principal partners to ensure that agreements will take a complementary approach to capacity-building for assessment and reporting, including data management. Cooperation is continuing with the ESCAP Statistics and Natural Resources Division, the UNDP Regional Office for Asia and the Pacific, the Asian Disaster Preparedness Centre, ICIMOD, the International Crop Research Institute for the Semi-Arid Tropics and the International Rice Research Institute.

251. The ENRIN programme for the Commonwealth of Independent States and central and eastern European countries with economies in transition continues through GRID-Arendal. Four GRID centres are operational in the region. Several proposals to continue capacity-building and networking for better environmental information on the national and sub-national level are awaiting funding.

252. ECA will organize the following workshops and seminars in 2001 and 2002 for the benefit of its member countries:

(a) A Subregional Workshop on Development of National Information and Communication Infrastructure (NICI) for Central African Countries;

(b) A National Workshop on Development of NICI for the Central African Republic;

(c) A Seminar on Standards and Specifications for Spatially Referenced Information Adapted to Africa's Environment: Increasing Networking, to be held in April 2001;

(d) A workshop for decision makers on GIS, addressing selected spatial applications, to be held in the third quarter of 2001, tentatively in Nairobi;

(e) A workshop on new database development technologies and on organization and management of development information, including dissemination on the Web and use of GIS in statistical offices, to be held in Addis Ababa in November 2001.

253. In collaboration with the Regional Centre for Mapping of Resources for Development, ECA plans to organize the following workshops:

(a) A workshop on applications of remote sensing and GIS to geological and mineral assessment mapping, to be held in Nairobi in March 2001;

(b) A workshop on the use of remote sensing for land use, land degradation assessment and monitoring, to be held in June 2001;

(c) A workshop on the application of remote sensing and GIS to early warning systems for food security;

(d) A workshop on remote sensing and GIS technology for teachers and educators, to be held in August 2001 or 2002.

254. The ECE Statistical Division is actively working on the international transfer of know-how in the use of GIS for collection and production of various statistical analyses and presentation of outcomes in diverse mapping forms. Within the framework of the programme of work of the Conference of European Statisticians, the Division carried out various activities. Its activities in 2001-2002 will focus mainly on exploring methods of integrating GIS with traditional statistical production systems, the potential for cross-sector analysis at national and international levels and spreading the use of the Internet for collection and dissemination of spatial statistical data. Other issues that will be studied in the near future are statistical data disclosure, the risk of misusing spatial statistical data and application of new technological developments in remote sensing.

255. These and many other questions will be discussed at the Work Session on Methodological Issues Involving the Integration of Statistics and Geography, which will be held in Tallinn from 25 to 28 September 2001. It should be highlighted that this meeting, the sixth in the series of meetings organized by the ECE secretariat since 1993, will be the first conducted jointly by ECE and the Statistical Office of the European Communities (Eurostat). The partnership with Eurostat will further increase the quality of international work in this field, avoid duplication of international activities and accelerate the transfer of know-how to those ECE member countries that are in the process of making a transition toward market economies. Furthermore, immediately after the work session in Tallinn, the secretariat will organize a workshop, including hands-on experience, focusing on the standardization of spatial data, pricing, spatial analysis and point-based versus area-based statistics.

256. The ECE Statistical Division will continue to work on the preparation of methodological materials, guidelines, standards and recommendations aimed at facilitating the implementation of GIS in statistical practice and to increase the national and international integration of statistical spatial data. For example, the methodological material entitled "Guidelines on cartography for statistical purposes" was finalized in June 2000 and is now available on the Internet (http://www.unece.org/stats/mapping).

257. ESCAP will contribute to the activities of the new CEOS Working Group on Education and Training for Developing Countries and will undertake technical advisory services on space technology applications for environment and natural resource management in its member States, upon request of Governments.

258. ESCAP will also continue to organize regional workshops and seminars on space technology applications for environmental monitoring, natural resource management, natural disaster mitigation, poverty alleviation, distance education and tele-medicine, which aim to build national capacity in using remote sensing, GIS and other space-related technologies to contribute to sustainable environmental and natural

resource management and improved quality of life in the region of Asia and the Pacific.

259. ESCAP will continue to provide medium- and long-term fellowships in 2001 and 2002 for training on remote sensing and GIS for environment and natural resources management and sustainable development planning in specialized educational institutions in the region of Asia and the Pacific.

260. FAO is developing cooperation with educational institutions with the objective of responding to training and capacity-building needs of developing countries in relation to space applications for natural resources management, environmental monitoring and distance education.

261. Phase II of the FAO Regional Remote Sensing Project for the member States of SADC resulted in the establishment of the SADC Regional Remote Sensing Unit with an advanced capacity for handling and analysis of the ARTEMIS and other environmental databases, direct reception and processing of Meteosat data and communication of various information products by electronic means to the SADC regional and national early warning systems, as well as to other users. A follow-up project for consolidating and strengthening the technical and institutional capacity for satellite-based environmental monitoring of SADC to support early warning systems for food security and forecasting of agricultural and rangeland production has been approved for funding by the European Union and became operational in July 2000 for a period of three years. This project is designed to develop and implement environmental monitoring activities related to food security at regional, national and subnational levels. It will be implemented by FAO in close cooperation with the SADC Food and Natural Resources Sector Unit and concerned SADC government agencies, and will also involve non-governmental organizations and the private sector.

262. A similar FAO regional project for the countries in the eastern Africa region has resulted in fully operational capacity in the Regional Centre for Services in Surveying, Mapping and Remote Sensing for processing Meteosat and NOAA-AVHRR global area coverage/local area coverage data and for generating information products, including the preparation of food-security early warning bulletins for the countries of the IGAD region. Another similar project for west and central Africa has also been formulated and is currently being reviewed for possible funding by the Government of Belgium.

263. WMO plans to continue to collaborate with the United Nations, other organizations and WMO members in the sponsorship of training events during the biennium 2001-2002. The postgraduate course in hydrology held annually in Kenya involves training in the use of satellite-based images and GIS in hydrology and water resource assessment. In the projects funded by the World Bank in the Mediterranean Sea basin, called MED-HYCOS, additional staff from participating countries were trained in the operation and management of DCPs using Meteosat for collecting hydrological, water-quality and related meteorological data, and on the application of MED-HYCOS tools to national hydrometeorological data. Within the framework of the SADC-HYCOS project funded by the European Commission in SADC for the development of a regional hydrological information system, staff from the national hydrological services of SADC countries have been trained in the installation, operation and maintenance of DCPs for collecting hydrological, water-quality and related meteorological data, on national and regional database management and Internet-served technologies. Within the framework of the AOC-HYCOS pilot project, training was conducted for the staff of the regional centre on the management of hydrological data transmitted via ARGOS and Meteosat systems

264. WMO grants fellowships under its Voluntary Cooperation Programme and its regular budget, as well as through UNDP and trust funds, for studies or training in meteorology, climatology and operational hydrology, including studies and training in satellite meteorology, interpretation of meteorological satellite photographs, satellite transmission systems and neph-analysis. In addition to the training of fellows at WMO regional meteorological centres, WMO members also provide training in numerical weather prediction products and interpretation of meteorological satellite data through fellowships offered by them under the Voluntary Cooperation Programme.

## F. Advancing scientific knowledge of space and protecting the space environment

265. The Office for Outer Space Affairs, within the framework of the United Nations Programme on Space Applications, will organize the Tenth United Nations/ESA Workshop on Basic Space Science from 25 to 29 June 2001 in Reduit, Mauritius. A similar workshop is also planned in 2002 for the benefit of the region of Latin America and the Caribbean.

266. The United Nations Programme on Space Applications, in cooperation with ESA, will continue to provide technical assistance for the establishment and operation of astronomical telescope facilities in Colombia, Egypt, Honduras, Jordan, Morocco, Paraguay, Peru, the Philippines, Sri Lanka and Uruguay. The establishment and operation of telescope facilities are follow-up projects of the series of United Nations/ESA workshops on basic space science.

## G. Other activities

267. The first World Space Week, held from 4 to 10 October 2000, included events around the world to celebrate and raise awareness about the many ways in which space science and technology can improve people's lives. The Office for Outer Space Affairs launched World Space Week on 4 October with special events at United Nations Headquarters, in cooperation with the Department of Public Information, and in Vienna, with the sponsorship of the Government of Austria. In addition, a large number of events were held around the world, organized and sponsored by national Governments, non-governmental organizations and the space industry.

268. The Scientific and Technical Subcommittee of the Committe on the Peaceful Uses of Outer Space will continue to consider the item "Use of nuclear power sources in outer space" at its thirty-eighth session, in 2001. The year 2001 is the second year of its four-year work plan on the item and the Subcommittee will review national and international processes, proposals and standards and national working papers relevant to the launch and peaceful use of nuclear power sources in outer space. To assist the Subcommittee in its discussions, IAEA submitted a preliminary review of documents relevant to the safety of nuclear power sources in outer space (A/AC.105/754).

269. The Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space will continue to consider an agenda item entitled "Information on the activities of international organizations relating to space law" at its fortieth session, in 2001.

270. The Office for Outer Space Affairs will continue to maintain, on behalf of the Secretary-General, the United Nations public register of information furnished in accordance with article IV of the Convention on Registration of Objects Launched into Outer Space (General Assembly resolution 3235 (XXIX), annex) and to disseminate such information to Member States.

271. UNEP continues to place strong emphasis on inter-agency cooperation at all levels in the central and eastern European region, in particular with UNHCR, UNITAR, ECE, UNDP, the WHO European Centre for Environment and Health, the World Bank, the Regional Environmental Centre in Budapest, the Organisation for Economic Cooperation and Development, the European Environment Agency, GEF, the Poland, Hungary: Aid for Reconstruction of the Economy (PHARE) Programme of the European Union, the Community Programme of Technical Assistance for CIS Countries (TACIS) and WCMC.

272. ECLAC regularly provides assistance concerning international law in force regarding outer space activities and in particular on the international regulations concerning the re-entry of space objects, especially those with nuclear power sources on board.

273. ESCAP will hold the annual meeting of the Regional Working Group on Space Sciences and Technology Applications in Beijing in May 2001. The venue of the annual meeting in 2002 is to be determined.

274. As follow up to the recommendations of the Second Ministerial Conference on Space Technology Applications for Sustainable Development, ESCAP plans to hold the following regional meetings:

(a) The seventh session of the Intergovernmental Consultative Committee on RESAP, in Hanoi in June 2001. The venue of the eighth session, in 2002, is to be determined;

(b) The inter-agency task force meeting on regional space applications for sustainable development in Asia and the Pacific, under the aegis of the environment and development advocacy of the Regional Coordination Meeting mechanism, in Bangkok in July 2001. The venue of the annual meeting in 2002 is to be determined;

(c) The third meeting of the Dialogue Forum on harmonization of regional space initiatives on space technology applications, in Kuala Lumpur in July 2001, to exchange information on the work of the member countries and on advances made by regional initiatives, including the Asia-Pacific Multilateral Cooperation in Space Technology and Applications and the Asia-Pacific Regional Space Agency Forum, and to identify substantive projects for implementation under regional arrangements. The venue of the fourth meeting is to be determined;

(d) Regional seminars and workshops on development of space technology applications for the minimum common programme of RESAP II.

275. ESCAP will continue to publish the annual *Asian-Pacific Remote Sensing and GIS Journal* in 2001 and 2002 and news on RESAP activities in Asia and the Pacific at the regional and national levels in the quarterly *Environment and Natural Resources Newsletter*.

276. ESCAP will continue to update its home page on space technology applications on the Internet. The ESCAP Regional Working Groups on Remote Sensing, Geographic Information Systems and Satellite-based Positioning; Satellite Communication Applications; Meteorological Satellite Applications and Natural Hazards Monitoring; and Space Sciences and Technology Applications will continue to develop and update their respective home pages.

277. ESCAP will prepare and disseminate publications on studies and pilot projects conducted within the framework of RESAP, as a part of its regular information service activities in 2001 and 2002.

278. FAO will continue to develop active partnerships with the European Union, the EC Joint Research Centre, NASA, NOAA, EUMETSAT, ESA and the National Space Development Agency of Japan, as well as other space agencies, on the development and operational use of new data sources with a view to improving its information services and to broadening the group of users, both at FAO headquarters and in the field.

279. In collaboration with intergovernmental organizations and non-governmental organizations, and through its networks in Molecular and Cell Biology (MCBN), the global MIRCEN web, and its Biotechnology Action Council (BAC) programme, UNESCO will continue to support research and training activities with living microbial systems and on their interaction with macrobiotic entities in extreme and harsh environments, thus aiding in the eventual emergence of exobiology research and planetary bioengineering of terrestrial and extraterrestrial environments.

280. UNESCO will support the Fourth Symposium on Information for Sustainable Development of the African Association of Remote Sensing of the Environment, which will be held in Cape Town, South Africa in 2002.

281. Following a decision of the General Conference of UNESCO at its twenty-eighth session to undertake studies at the regional level on the implications of electronic communication technologies, or the "information superhighways", for the protection and dissemination of intellectual works by electronic means, the three regional committees, for Latin America, Asia and Europe, assessed the basic infrastructure of the various segments of the information superhighways, mainly the convergence of telecommunications, broadcasting, including satellite broadcasting, and electronic networks. The regional committees will have to define for their regions the following (see A/AC.105/726, paras. 190 (a)-(c)):

(a) An outline of a national policy for the implementation of the basic infrastructure of transmission and digital dissemination of information;

(b) The main principles to follow in adapting national laws in order to ensure the protection of the legitimate rights of authors and of others in the digital multi-media context, as well as to promote regional harmonization to secure cultural exchange;

(c) The strategy to be adopted by the States of the region and measures to be taken in order to promote the creation and development of cultural industries that will produce and disseminate products relating to digital works and performances as well as distance education.

282. The World Commission on the Ethics of Scientific Knowledge and Technology (COMEST), a consultative body created by UNESCO following its twenty-ninth General Conference, is an intellectual forum aimed at assisting the process of reflection on ethical aspects. In cooperation with ESA, the Subcommission on the Ethics of Outer Space was set up and met for the first time in July 2000. The aim of the Subcommission is to consider facts logically and draw up guidelines as an outcome of ethical reflection. The intention is to safeguard human dignity, and therefore to highlight the diversity of human societies. The Subcommission considered it necessary to facilitate the emergence of an "ethics of space" through worldwide consultation with a view to reaching a common understanding of principles and guidelines which may evolve in the light of progress of knowledge and technologies while remaining based on unanimously recognized essential values, such as respect for dignity and socio-cultural identities, respect for free choice and a critical spirit and respect for the principles of equity and solidarity. In that regard, the Subcommission will present draft recommendations at the second session of COMEST, to be held in September 2001, which will then be presented to UNESCO member States. The activities undertaken by COMEST in ethics of outer space permitted the initiation of a fruitful collaboration between UNESCO and the Office for Outer Space Affairs in the framework of the Committee on the Peaceful Uses of Outer Space.

283. In cooperation with national commissions, intergovernmental and non-governmental organizations, such as the International Brain Research Organization, the World Federation for Culture Collections and the International Union of Microbiological Societies, UNESCO will continue to support activities that are of relevance to the NASA Space Life Sciences Programme, such as (a) neurovestibular monitoring research that is of significance in biological guidance systems applicable to eye movements, posture, motor locomotion and nerve pulses; (b) space motion sickness resulting from travel in hermetical environments; (c) exposure to gravitation and radiation; (d) plant photosynthesis in biospheric monitoring; (e) disease prediction; and (f) cosmic evolution of prebiogenic compounds.

284. WIPO recognizes that significant changes and development in space activities give rise to new issues, such as intellectual property. As stated in the report of UNISPACE III,[3] WIPO shares the view that intellectual property rights play an essential role in the development and transfer of space technology in the current political and economic environment, which has resulted in a shift in space activities towards commercial opportunities and privatization. In this connection, WIPO is currently studying the issue of the protection of inventions made or used in outer space and will explore the desirability and feasibility of further harmonization of international standards and legislation.

## V. Concluding remarks on matters related to the coordination of activities within the United Nations system

285. The latest restructuring of the Administrative Committee on Coordination machinery, which took place from 1992 to 1993, resulted in a decision by the Organizational Committee of the Administrative Committee on Coordination in April 1993 that inter-agency consultations in the area of outer space need not be part of the Administrative Committee on Coordination machinery. Since that decision, the Inter-Agency Meeting on Outer Space Activities has no longer been a subcommittee of the Administrative Committee on Coordination. It has, however, continued to report to the Committee on the Peaceful Uses of Outer Space and its Scientific and Technical Subcommittee on the coordination of space-related activities in the United Nations system.

286. The current work of the Inter-Agency Meeting includes the following: (a) in-depth review of the cooperation of the organizations of the United Nations system in remote sensing and related geographic information system activities: implementation of the recommendations of Agenda 21; (b) enhancement of coordination among the organizations of the United Nations system through the use of advanced information technologies; and (c) review of the plan of action of UNISPACE III and implementation of follow-up activities.

287. At its twentieth session, held in February 2000, the Inter-Agency Meeting agreed that its work should be brought more prominently to the attention of the heads of organizations of the United Nations system. In

that connection, the Inter-Agency Meeting agreed that the Office for Outer Space Affairs should explore the possibility of requesting the Administrative Committee on Coordination to resume its consideration of the item on the coordination of space-related activities within the United Nations system.

*Notes*

[1] *Report of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space, Vienna, 19-30 July 1999* (United Nations publication, Sales No. E.00.I.3), chap. I, resolution 1.

[2] Ibid., annex III, sect. IV.

[3] *Report of the Third United Nations Conference* ..., op. cit.

# Annex I

## Calendar of significant events

| *Date* | *Event* | *Venue* |
|---|---|---|
| **2001** | | |
| 18 January | Environmental Monitoring of Refugee Camps using High-Resolution Satellite Images (ENVIREF) Demonstration Workshop on the Use of Satellite Imagery for Humanitarian Relief Operations (see also www.enviref.org) | Geneva |
| 12-23 February | Thirty-eighth session of the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space | Vienna |
| 5-7 March | Second plenary meeting of the United Nations Geographic Information System Working Group | Rome |
| 14-16 March | Sixth Meeting of the Economic and Social Commission for Asia and the Pacific (ESCAP) Regional Working Group on Satellite Communication Applications | Bangkok |
| 21-23 March | Fourth International Global Disaster Information Network Conference | Canberra |
| 25-29 March | Fourth United Nations/European Space Agency (ESA)/Committee on Space Research Workshop on Data Analysis Techniques | Damascus |
| 2-12 April | Fortieth session of the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space | Vienna |
| 3-5 April | Sixth Meeting of the ESCAP Regional Working Group on Meteorological Satellite Applications and Natural Hazards Monitoring | Kuala Lumpur |
| 2 May-8 June | Eleventh United Nations/Sweden International Training Course on Remote Sensing Education for Educators | Stockholm and Kiruna, Sweden |
| 9-11 May | Sixth Meeting of the ESCAP Regional Working Group on Space Sciences and Technology Applications | Beijing |

| *Date* | *Event* | *Venue* |
|---|---|---|
| 1 June | Integrated Global Observing Strategy Partners Meeting | Paris |
| 6-15 June | Forty-fourth session of the Committee on the Peaceful Uses of Outer Space | Vienna |
| 25-29 June | Tenth United Nations/ESA Workshop on Basic Space Science | Reduit, Mauritius |
| 25-27 June | Seventh Meeting of the ESCAP Regional Working Group on Remote Sensing, Geographic Information System and Satellite-based Positioning | Hanoi |
| 28-30 June | Seventh session of the Intergovernmental Consultative Committee on the Regional Space Applications Programme for Sustainable Development | Hanoi |
| 2 July | Inter-agency task force meeting on regional space applications for sustainable development in Asia and the Pacific, under the aegis of the environment and development advocacy of the Regional Coordination Meeting mechanism | Bangkok |
| First half | United Nations Workshop on Satellite-aided Search and Rescue Systems, for the benefit of Asia and the Pacific | Bangalore, India |
| 2-5 July | United Nations/ESA Workshop on Remote Sensing for Environmental Monitoring and Natural Resource Management | Prague |
| 24-26 July | Third Meeting of the Dialogue Forum on harmonization of regional space initiatives in space technology applications | Kuala Lumpur |
| 25-28 September | Work Session on Methodological Issues involving the Integration of Statistics and Geography | Tallinn |
| September | Second United Nations/Austria Symposium on Enhancing the Participation of Youth in Space Activities | Graz, Austria |
| 4-10 October | World Space Week | Worldwide |

| *Date* | *Event* | *Venue* |
|---|---|---|
| September/ October | United Nations/International Astronautical Federation (IAF) Workshop on the Use of Space Technology for the Benefit of Developing Countries | Toulouse, France |
| October | United Nations/International Academy of Astronautics Workshop on Small Satellites at the Service of Developing Countries: the African Perspective | Toulouse, France |
| Second half | United Nations Workshop on Earth Observation as an Instrument for Solving Development Problems in Sub-Saharan Africa | Southern Africa |
| Second half | United Nations Expert Meeting on the Regional Centres for Space Science and Technology Education: Status and Future Developments | Frascati, Italy |
| Second half | United Nations/United States of America Workshop on the Use of Global Navigation Satellite Systems | Vienna |
| Second half | United Nations/United States of America Workshop on the Use of Global Navigation Satellite Systems | Kuala Lumpur |
| Second half | United Nations/ESA Workshop on the Use of Space Technology in Disaster Management | Beirut |
| **2002** | | |
| May-June | Twelfth United Nations/Sweden International Training Course on Remote Sensing Education for Educators | Stockholm and Kiruna, Sweden |
| September | Third United Nations/Austria Symposium on Enhancing the Participation of Youth in Space Activities | Graz, Austria |
| October | United Nations/IAF Workshop on the Use of Space Technology for the Benefit of Developing Countries | Houston, Texas, United States of America |
| To be announced | Third United Nations/United States of America Workshop on the Use of Global Navigation Satellite Systems, for the benefit of developing countries in the Latin American and Caribbean region | To be announced |

| *Date* | *Event* | *Venue* |
|---|---|---|
| To be announced | Fourth United Nations/United States of America Workshop on the Use of Global Navigation Satellite Systems, for the benefit of developing countries in the African region | To be announced |
| To be announced | United Nations/United States of America International Meeting on the Use of Global Navigation Satellite Systems | To be announced |
| To be announced | Eleventh United Nations/ESA Workshop on Basic Space Science | To be announced |
| To be announced | United Nations/ESA Workshop on the Use of Space Technology in Disaster Management, for the benefit of developing countries in the Asia-Pacific region | To be announced |
| To be announced | United Nations/ESA Workshop on the Use of Space Technology in Disaster Management, for the benefit of developing countries in the central and eastern European region | To be announced |
| To be announced | Seventh Meeting of the ESCAP Regional Working Group on Satellite Communication Applications | To be announced |
| To be announced | Seventh Meeting of the ESCAP Regional Working Group on Space Sciences and Technology Applications | To be announced |
| To be announced | Eighth Meeting of the ESCAP Regional Working Group on Remote Sensing, Geographic Information System and Satellite-based Positioning | To be announced |
| To be announced | Eighth session of the Intergovernmental Consultative Committee on the Regional Space Applications Programme for Sustainable Development | To be announced |
| To be announced | Inter-agency task force meeting on regional space applications for sustainable development in Asia and the Pacific, under the aegis of the environment and development advocacy of the Regional Coordination Meeting mechanism | To be announced |
| To be announced | Fourth Meeting of the Dialogue Forum on harmonization of regional space initiatives in space technology applications | To be announced |

# Annex II

## List of significant outputs

| *Symbol* | *Title or description* | *Date of issuance* |
|---|---|---|
| **Office for Outer Space Affairs** | | |
| A/56/20 | Report of the Committee on the Peaceful Uses of Outer Space on its forty-fourth session (6-15 June 2001) | Late 2001 |
| ST/SPACE/5 | *Seminars of the Programme on Space Applications*, No. 12 | 2001 |
| ST/SPACE/6 | *Highlights in Space 2000* | 2001 |
| **Economic Commission for Africa** | | |
| *Studies and background documents*: | | |
| E/ECA/ADF/99/4 | Democratizing access to the information society | 1999 |
| E/ECA/ADF/99/6 | Information and communication technologies for improved governance in Africa | 1999 |
| E/ECA/ADF/99/7 | Globalization and the information economy: challenges and opportunities for Africa | 1999 |
| E/ECA/ADF/99/8 | The process of developing national information and communications infrastructure (NICI) in Africa | 1999 |
| E/ECA/DISD/GEOINFO. DOC.1/00 | The future orientation of geo-information activities in Africa | 2000 |
| **Economic and Social Commission for Asia and the Pacific** | | |
| | *Asian-Pacific Remote Sensing and GIS Journal*, vol. 11, No. 2 (January 1999) (United Nations publication, Sales No. E.00.II.F.15) | 1999 |
| | *Asian-Pacific Remote Sensing and GIS Journal*, vol. 12, No. 1 (July 1999) (United Nations publication, Sales No. E.00.II.F.16) | 1999 |
| ST/ESCAP/1868 | Space Technology Application Capabilities: Facilities and Activities in the ESCAP Region-A Regional Inventory (United Nations publication, Sales No. E.99.II.F.45) | 1999 |

| *Symbol* | *Title or description* | *Date of issuance* |
|---|---|---|
| ST/ESCAP/1968 | Space Technology and Applications for Sustainable Development in Asia and the Pacific: Compendium (United Nations publication, Sales No. E.99.II.F.67) | 1999 |
| ST/ESCAP/2048 | Directory of Meteorological Satellite Applications | 1999 |
| ST/ESCAP/2050 | Remote Sensing for Tropical Ecosystem Management: Proceedings of the Eighth Regional Seminar on Earth Observation for Tropical Ecosystem Management (United Nations publication, Sales No. E.00.II.F.52) | 1999 |
| ST/ESCAP/2059 | Delhi Declaration on Space Technology Applications in Asia and the Pacific for Improved Quality of Life in the New Millennium and Strategy and Action Plan on Space Technology Applications for Sustainable Development in Asia and the Pacific for the New Millennium | 2000 |
| ST/ESCAP/2062 | Second Ministerial Conference on Space Applications for Sustainable Development in Asia and the Pacific, New Delhi, 15-20 November 1999: Proceedings | 2000 |
| | *Space Technology Applications Newsletter*<br>URL:www.unescap.org/enrd/space/index.htm | Quarterly |

**International Civil Aviation Organization**

The seventh meeting of the Aeronautical Mobile Communications Panel developed some generic provisions for some possible applications of next generation satellite systems. Those provisions could assist in the development of technology and serve as a baseline for prospective aeronautical service providers.

**International Telecommunication Union**

| | |
|---|---|
| *Handbook on Satellite Communications (Fixed Satellite Service)*, third ed. | 2000 |
| *Handbook on the Mobile Satellite Service* | 2000 |
| *Handbook on Broadcasting Satellite Systems* | 2000 |